FULFILLING THE PROMISE OF MIDI!

Dr. T's MUSIC SOFTWARE

KEYBOARD CONTROLLED SEQUENCER

USER'S GUIDE

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KEYBOARD CONTROLLED SEQUENCER, VERSION 2. USER'S MANUAL

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Manual written by Mark Styles
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GETTING STARTED - HOW TO USE THIS MANUAL

The KEYBOARD CONTROLLED SEQUENCER is a program which performs several independent, yet inter-related functions. Some functions you will use quite frequently, others only occasionally, and perhaps some not at all. Such a wide variety of options may make the program difficult to learn at first.

We recommend you read through the DESIGN OVERVIEW and the TUTORIAL, trying the features as you go. Refer to the the other sections when you want to know more about a specific function. In between sessions with Dr. T's Keyboard Controlled Sequencer, read through Chapters 4 - 7.

Once you become familiar with all the features of the KEYBOARD CONTROLLED SEQUENCER, you will develop your own method of using it, depending on the equipment you are using and your approach to music. As with any complex system, it takes time to come to a complete understanding of all the parts and how they may be used together.

It is wise to periodically SAVE A COPY OF YOUR WORK TO DISK in case of an accident. Before you start creating a lot of sequences, INITIALIZE A FEW BLANK DISKS TO STORE YOUR SEQUENCES ON. You may initialize disks according to the Commodore manual or use the INITIALIZE command found on MENU 2 of the main program.

Until you have a basic understanding of operation, we recommend that you USE THE KEYBOARD CONTROLLED SEQUENCER WITHOUT THE DRUM MACHINE.

NEVER MOVE THE COMPUTER WHILE THE SYSTEM IS POWERED UP! If contact is momentarily broken on certain pins between the interface box and computer, severe damage may result!

If for some reason a BASIC error occurs, or you inadvertently hit RUN/STOP, type GOTO2 (RETURN) to continue without losing any data. DO NOT TYPE RUN.

EQUIPMENT HOOK-UP

Depending on the equipment you have, there can be several ways to connect the various synths, drum machines, sync boxes etc. See Appendix - EQUIPMENT HOOK-UP.

DESIGN OVERVIEW

THE KEYBOARD CONTROLLED SEQUENCER can have up to 35 independent Sequences stored in memory at one time. Each sequence is assigned to and called up by one key on the computer. This key can either be a letter (A - Z) or a number (1 - 9). The playback of each sequence may be independently controlled in real-time using the computer's keyboard, and as many Sequences as desired can be played simultaneously.

The SEQUENCER will hold 3550 MIDI events. Each sequence is stored as consecutive events in memory. During the course of a session, gaps may be created in available memory. Saving the data to disk and then retrieving it will eliminate these gaps giving you more storage area. The DISPLAY SEQUENCE MAP option will show you how the available memory is being used by the computer.

MIDI events recognized and transmitted by the SEQUENCER are: note on and off, pitch bend, channel pressure (after-touch), control change, and program change. To save memory, note ON and OFF events can be recorded separately from other MIDI events. MIDI channel information is recognized and you may send single MIDI bytes or system exclusive information to any synthesizer, by inserting this data into sequences using the EDIT mode.

A very extensive EDIT mode lets you make individual or global changes to pitch, duration, velocity, MIDI channel, and timing for all notes in a Sequence. Transpose features include auto-correct of time and duration, time compression/expansion, time reversal and auto channel assign.

USING THE COMMODORE KBD

The Commodore keyboard consists of a basic typewriter layout with a few additional keys and four FUNCTION keys. Dr. T's KEYBOARD CONTROLLED SEQUENCER uses several different MENUS to provide various options. Be sure the SHIFT LOCK key is off, otherwise the keyboard will appear to be dead.

When you are using a menu which has no blinking cursor, (the MAIN MENU for example), only one key is required to select a function. When a menu has a blinking cursor then you need to supply a key or a value, and a (RETURN) to complete the action (such as designating a Sequence key for CREATE NEW SEQUENCE).

An invalid selection in the MAIN MENU or MENU 2 is ignored. The computer will wait until you select a key corresponding to a valid option. An invalid selection on the other menus will usually result in the message INVALID ENTRY at the bottom of the screen for two seconds.

Whenever you select an option that will erase or modify a large amount of data such as a previously recorded sequence or file on the disk, the computer will ask ARE YOU SURE? Pressing the Y key will proceed with the operation. Any other key will exit to the previous menu, making no changes.

The keys 0, X and F1 will get you out of situations when you've changed your mind about something. The 0 key aborts any main menu command (CREATE, MERGE, COPY, DELETE, etc). The X key quits the EDIT mode, and F1 stops PLAY or RECORD functions.

FUNCTION KEYS AND FOOTSWITCH

The row of four keys at the right of computer keyboard are called FUNCTION KEYS. They are used in PLAY, REAL-TIME & STEP-TIME RECORD, and OVERDUB.

F1 stops execution of the current function and exits to the previous function.

F3 toggles ALIGN mode on/off. When RECORDING, ALIGN causes the sequence to be a whole number of measures long. In the PLAY mode, ALIGN causes all sequences to start a whole number of measures after the the first sequence was started. In STEP-TIME, F3 resets the time of the next note to the currently selected time value.

F5 CANCELS all sequences when in PLAY, RECORD, or OVERDUB. It also ERASES any sequence currently being recorded. In STEP-TIME RECORD, F5 functions as a REST key.

F7 in the RECORD mode, starts and stops the recording process. In the OVERDUB mode F7 begins a sequence with a rest. In the PLAY mode, F7 controls the realtime repeats of Sequences 1 - 9. In STEP-TIME, F7 plays the sequence that has been entered so far.

The FOOTSWITCH, which plugs into the SCI box, duplicates all of the functions performed by the F7 key.

LOADING THE PROGRAM

Two different procedures are used to load the KEYBOARD CONTROLLED SEQUENCER (depending on which MIDI interface box you are using). Later versions of the software will work on several different MIDI interface boxes. If you have a SCI model 64 box, follow procedure 1. All other interface boxes use procedure 2. The program itself loads in two sections, INITIALIZATION and MAIN PROGRAM.

Note you can successfully LOAD THE PROGRAM WITH THE WRONG INTERFACE BOX, BUT YOU WILL NOT BE ABLE TO RECORD OR PLAY SEQUENCES.

PROCEDURE 1 (SCI MODEL 64)

1. Press (RETURN) to bypass drum interface questions.
2. Insert Dr. T Disk into drive.
3. Press E to load EXPANSION SOFTWARE.
4. Press Y to confirm.

The SEQUENTIAL CIRCUITS MIDI 64 box puts you into its sequencer program immediately on power up. The Sequential logo will be replaced with LOADING DR. T SOFTWARE and then go blank while the disk continues to load. The program will come up in the INITIALIZATION section.

PROCEDURE 2 (all other interfaces)

1. Type LOAD "S",8 (RETURN)
2. When READY appears, Type RUN (RETURN)

The software will ask which interface box you are using. Select the interface you have and disk loading will begin. The program will then come up in the INITIALIZATION section.

A TUTORIAL FOR FIRST TIME USER

Since the KEYBOARD CONTROLLED SEQUENCER is a complex program, we will start with a few basic procedures before moving on to the more complex features of the program. LOAD the program as described under LOADING THE PROGRAM in the GETTING STARTED section.

For the time being DO NOT USE A DRUM MACHINE. When you have mastered the basic concepts, then begin working with your drum machine.

If you want to know more about a specific function, read through CHAPTERS 4 - 8.

INITIALIZATION

When you first load the program, the INITIALIZATION menu appears on the screen. Here you may specify CLOCK functions, do DISK DIRECTORIES, CHANGE COLORS (on color monitors), and change STEP-TIME and REAL-TIME TRANSPOSE default settings.

For now, leave the defaults as they are, and press 0 to load the main program.

MAIN PROGRAM

The main program consists of the MAIN MENU and MENU 2, along with several other screens which will be used for recording, editing, displaying memory maps, etc. The MAIN MENU accesses the six most used features of the Sequencer.

```
DR. T'S MUSIC SOFTWARE

KEYBOARD CONTROLLED SEQUENCER

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  OPTIONS ARE:
  1.   PLAY
  2.   CREATE NEW SEQUENCE
  3.   EDIT SEQUENCE
  4.   COPY/APPEND SEQUENCES
  5.   MERGE SEQUENCES
  6.   OVERDUB
  7.   OTHER OPTIONS
  ENTER OPTION:
```

Select 7. OTHER OPTIONS to access MENU 2 which looks like:

```
OPTIONS ARE:
1.   DISPLAY SEQUENCE MAP
2.   CHANGE STEPS/MEASURE
3.   DEFINE NEW KEY ASSIGNMENT
4.   CHANGE CLOCK
5.   DELETE SEQUENCE
6.   LOAD DATA FROM DISK
7.   SAVE DATA TO DISK
8.   INITIALIZE DISK
9.   RETURN TO INITIALIZATION
ENTER OPTION:
```

We will want to INITIALIZE A DISK to store song files on. Select option 8 INITIALIZE DISK. The program will prompt with ALL DATA ON DISK WILL BE ERASED and asks the question ARE YOU SURE? Insert a blank disk (or one whose contents you don't need anymore) and press Y. After about 40 seconds the MAIN MENU will return. Label your disk SONGS or SEQS and return it to the disk drive.

RECORDING A SEQUENCE

We are now ready to record our first sequence. Select CREATE A NEW SEQUENCE, option 2. The computer will prompt ENTER SEQUENCE KEY. This represents which key is used to identify the sequence. It can be a letter A - Z or a number 1 - 9. Let's create our first sequence and assign it to key 1. Press 1 (RETURN).

Our next option will be the method for entering notes. We have the choice of real-time recording, step-time recording, or entering events from the computer. Select option 1 - RECORD IN REAL-TIME.

Next will be six options representing various types of data to record. For now, use the default setting which records notes only. Press (RETURN).

A new display will come up. This display is for REAL-TIME RECORD, OVERDUB and PLAY. At this time only Sequence 1 will be listed (under S column). Next to it will be the value 99, representing the number of REPEATS that have been designated. Whenever you create a new sequence, the number of repeats is set to 99; you may change this later in the EDIT mode.

Recording with the ALIGN feature will cause the program to wait until the end of the current measure before finishing recording. You turn on the ALIGN feature by pressing F3. The work ALIGN will appear at the bottom left of the screen. If you don't use ALIGN you may fix the end or any part of a sequence from the EDIT mode.

When you begin playing on the synth KBD, the METRONOME (bottom right of screen) will start blinking and the MEASURE display will start counting up. An audio signal is output to the Commodore A/V cable.

If, during RECORDING, you make a mistake or wish to start again, press F5 and then the SPACE BAR.

F5 during REAL-TIME RECORD, erases the current sequence just recorded, and stops the internal clock. The SPACE BAR will start the internal clock again. The MEASURE COUNTER will continue from the last measure, but reset itself to 1 and continues counting when you begin playing the KBD.

When thru RECORDING, press F7 or the footswitch to stop recording and begin playback. This sequence will repeat indefinitely until you press F7 (which forces 1 more repeat & stops) or F1 (which exits back to the MAIN MENU). You may also use F5 and the SPACE BAR to record over the sequence.

REAL-TIME TRANSPOSE

Try the REAL-TIME TRANSPOSE features. The + key will transpose the pitch up one step. Pressing SHIFT and the + key will transpose the pitch back down. You may transpose pitch, duration and velocity for any two sequences. See the REAL-TIME TRANSPOSE section for complete commands.

Some keyboards may not accept MIDI data over the whole MIDI keyboard. If you transpose a sequence to the end of an instrument's range, the sequence will end up consisting of one note. Pressing SHIFT and F1, F2, and F3 will reset all transpose functions to their original starting point. When thru transposing press F1 to return to the MAIN MENU.

COPYING A SEQUENCE

Before we begin EDITING a sequence, we shall make a copy of it in case we don't like the results of our editing. IF YOU ARE GOING TO DO ANY EXTENSIVE EDITING TO A SEQUENCE, MAKE A COPY. To make a copy, select option 4 COPY/APPEND SEQUENCES. The computer will prompt ENTER SOURCE: Enter the Sequence key you wish to make a copy of. The computer will then prompt ENTER TARGET: Select an unused Sequence key. The computer will ask ARE YOU SURE? Answer with a Y. We now have a back-up copy of the sequence should we inadvertently destroy the sequence while using the EDIT features.

EDITING A SEQUENCE

To examine and EDIT the sequence we have just recorded, press 3. In response to the prompt ENTER SEQUENCE KEY, press 1. The next display will list the Sequence number, LAST PLAY ENDED AT (line #), and a menu of 14 options which we may perform.

You should note that the edit options are selected using a COMMAND LINE which consists of an abbreviation for a command, followed by a range if desired, a (SPACE) and then a (RETURN). An example of a COMMAND LINE would be L2-14 (RETURN) which would list events 2 - 14.

To NAME the sequence, press N and a name which may consist of up to eight characters long and a (RETURN). Do not put a space after the N. If we enter NHORNHARP, the Sequence will be named HORNHARP.

LIST AND EDIT

To LIST and EDIT press key L and (RETURN). The next screen provides an event list of what we recorded. A blinking cursor will be at the left side of the last event line. A simple D chord struck once and then each note played individually might look like this when listed:

	MSR-ST	EVNT	TIME	CH	TYP	NOTE	VEL	DUR
	1-1	1	0	1	ON	D 4	60	9
	1-1	2	0	1	ON	D 5	68	9
	1-1	3	0	1	ON	F# 4	50	8
	1-1	4	0	1	ON	A 4	67	9
	1-38	5	37	1	ON	D 4	34	2
	1-57	6	19	1	ON	F# 4	60	10
	1-76	7	19	1	ON	A 4	64	9
	1-95	8	19	1	ON	D 5	73	7
*	2-51	9	52		DE			

The table above contains a precise description of all recorded events. Following is a definition of each item contained in the listed sequence.

MSR-ST = MEASURE-STEP: This is computed by the program and can not be changed. It shows the measure and step at which the event occurs.

EVNT = EVENT: EVNT provides you with a way to designate specific events in the sequence when you are using the various EDIT options. This also is computed by the program and can not be changed.

TIME = The time at which this event occurs in relation to the start of the previous event. Time is measured in steps of the internal clock or drumbox. Changing the current value

will move this note and all subsequent notes forwards or backwards in time.

CH = MIDI channel. You may change the MIDI channel for each note individually.

TYP = TYPE of event. There are nine types of events which may be recorded. ON stands for NOTE ON. See Chapter 4 - 22 for an explanation of different types of events.

NOTE = the note value and octave. Note that the Sequencer makes no provision for flats. Specify B flat as A#.

VEL = VELOCITY. Specifies how fast the key was depressed. Various synths can use this parameter to alter filter, volume or other characteristics of the sound.

DUR = DURATION. This specifies how long the note was actually held down.

YOU CAN STOP THE LISTING BEFORE IT IS COMPLETED BY PRESSING ANY KEY. Pressing another key will continue listing. TO STOP THE LISTING AND BEGIN EDITING, HIT F1 TWICE WHILE THE LIST IS STOPPED, OR ONCE WHILE IT IS LISTING.

Any EDIT command may be executed while the list is displayed by entering the EDIT command at the start of the line. Be sure to leave a space at the end of the command, before pressing (RETURN).

You may correct or change individual values by using the CRSR (and SHIFT CRSR) keys. To change the DURATION value in line 5, hold SHIFT and press the vertical CRSR key to move up four lines, then hold down the horizontal CRSR till the cursor reaches the value 2. When the cursor is sitting on the desired location, enter a new value. After making the desired change, press (RETURN). The numbers under MSR-ST will be erased, indicating the change has been accepted. If you LIST the sequence again, all the MSR-ST values will be displayed.

It is important to pay attention to the numbers under the MSR-ST column. You may find it useful to keep a calculator handy, and after spending a little time with EDITING you will start to recognize multiples of 12 (8th notes).

SPECIFYING A RANGE

A range may be specified for the TRANSPOSE, LIST, QUICK LIST, HARD COPY, DELETE, PLAY, COPY, and MOVE COMMANDS. Use the first letter of the desired command, followed by the start and stop points, a space and (RETURN). T2-5 (RETURN), L3-19 (RETURN), D6-9 (RETURN). If you are in the menu page of EDIT, you do not need to include the space.

PLAYING A SEQUENCE FROM THE EDIT MODE

You may play any sequence from the EDIT mode. To play the sequence you are currently editing, press P (RETURN). The sequence will play one time. To play it again, press Z.

If you want to hear only a portion of the sequence you are currently editing, specify a range after the P command. P3-25 (RETURN).

If you wish to hear several sequences play from EDIT; press F5 to stop the internal clock. Press the corresponding keys for any sequences you wish to hear, and then press the (SPACEBAR) to start the internal clock. If you want to hear the current sequence you are EDITING, press the Z key. Press F1 to exit from the play mode.

TRANSPOSE/AUTO

Let's correct the timing of the notes by pressing T (RETURN) for TRANSPOSE/AUTO. Seven options are displayed to choose from; select AUTO-CORRECT by pressing 4 and (RETURN).

Respond to the ENTER STEP COUNT prompt by entering the quantization value for note separation. The auto-correction process causes all note separations (the TIME of one event start to the next event start) to be multiples of the STEP COUNT. To make all note separations multiples of an eighth-note, enter a STEP COUNT of 12 (1/8 of the measure length of 96).

If you wish to quantize the DURATION value also, enter a value for this factor. Press (RETURN) for now, which will direct the computer to make no auto-correct changes to DURATION.

The program will ask ARE YOU SURE?. Enter a Y; any response other than Y will cause the program to assume you have changed your mind and abort the current command. After a brief pause the EDIT menu will appear again. Let's lengthen the DURATION time; press T and (RETURN) again. Select option 3 TRANSPOSE DURATION. You can enter either a positive transpose factor by specifying a number or a negative transpose number by putting a minus - in front of the number. You can invert the DURATION value by entering I. Inverting will make a short duration long, and a long duration value short. Enter the value 8 for now. This will make all the values under DURATION 8 counts longer than they previously were. Answer Y again to ARE YOU SURE?

List the sequence again.

MSR-ST	EVNT	TIME	CH	TYP	NOTE	VEL	DUR
1-1	1	0	1	ON	D 4	60	17
1-1	2	0	1	ON	D 5	68	17
1-1	3	0	1	ON	F# 4	50	16
1-1	4	0	1	ON	A 4	67	16
1-37	5	36	1	ON	D 4	34	15
1-61	6	24	1	ON	F# 4	60	16
1-73	7	12	1	ON	A 4	64	15
2-1	8	24	1	ON	D 5	73	16
* 2-49	9	48		DE			

Note that the TIME values have been rounded off (quantized) to the nearest multiple of 12. In the first note list events 7 and 8 were both 19's. Now one has been rounded to 12 and the second to 24. YOU MAY NOT ALWAYS GET THE DESIRED RESULTS WHEN AUTO-CORRECTING, so it is a good idea, especially when working with long sequences which contain chords, TO MAKE A COPY OF A SEQUENCE BEFORE MODIFYING IT.

Note that the MSR-ST values have been recomputed using the values in the TIME column. We can ascertain that the STEPS/MEASURE is set to 96 by examining lines 7 and 8. Event 7 occurs at step 73 of measure 1. Event 8 which is a quarter note (value of 24) happens in the first step of measure 2.

To TRANSPOSE only a selected range of events, type T1-4 (RETURN). Don't forget the SPACE before (RETURN). From the TRANSPOSE menu select option 1, TRANSPOSE PITCH. Entering 7 as the amount results in A chord.

MSR-ST	EVNT	TIME	CH	TYP	NOTE	VEL	DUR
1-1	1	0	1	ON	A 4	60	17
1-1	2	0	1	ON	A 5	68	17
1-1	3	0	1	ON	C# 4	50	16
1-1	4	0	1	ON	E 4	67	16
1-37	5	36	1	ON	D 4	34	15
1-61	6	24	1	ON	F# 4	60	16
1-73	7	12	1	ON	A 4	64	15
2-1	8	24	1	ON	D 5	73	16
* 2-49	9	48		DE			

Press X to exit back to the EDIT menu.

COPY OR MOVE EVENTS

If you want to COPY or MOVE events, press the C or M key and specify a range. For instance if we wished to make the sequence end with a chord again, we would enter C1-4 (RETURN). In response to the INSERT AFTER prompt enter 9. Again the program will ask ARE YOU SURE? The next listing would look like:

MSR-ST	EVNT	TIME	CH	TYP	NOTE	VEL	DUR
1-1	1	0	1	ON	A 4	60	17
1-1	2	0	1	ON	A 5	68	17
1-1	3	0	1	ON	C# 4	50	16
1-1	4	0	1	ON	E 4	67	16
1-37	5	36	1	ON	D 4	34	15
1-61	6	24	1	ON	F# 4	60	16
1-73	7	12	1	ON	A 4	64	15
2-1	8	24	1	ON	D 5	73	16
2-49	9	48		DE			
2-49	10	0	1	ON	A 4	60	17
2-49	11	0	1	ON	A 5	68	17
2-49	12	0	1	ON	C# 4	50	16
* 2-49	13	0	1	ON	E 4	67	16

Notice that the last chord has a 0 TIME value and the MSR-ST are all 2-49's. The MOVE command is similar to a COPY command except that the range of events are deleted from where they originally were and moved to the new location. With a COPY command the range of events is in both the old and new location.

DELETING NOTES

You may delete notes by specifying an individual event line or a range of line numbers. D5-7 would delete events 5 - 7. The remaining notes however, would be moved forward in time, making your sequence shorter than originally recorded. If you wish to erase only a specific note or notes, and keep the remainder of the sequence intact, use the event type DE. This will keep the timing of the sequence unchanged. The effect would be as if the volume had been turned down for a specific note.

We can erase the second F# of the above sequence by changing event 6 from an ON to DE event followed by (RETURN).

MSR-ST	EVNT	TIME	CH	TYP	NOTE	VEL	DUR
1-61	6	24	1	DE	F# 4	60	16

When you LIST again, line 6 will have no values under NOTE, VEL, and DUR. The timing of the Sequence remains the same.

MSR-ST	EVNT	TIME	CH	TYP	NOTE	VEL	DUR
1-1	1	0	1	ON	D 4	60	17
1-1	2	0	1	ON	D 5	68	17
1-1	3	0	1	ON	F# 4	50	16
1-1	4	0	1	ON	A 4	67	16
1-37	5	36	1	ON	D 4	34	15
1-61	6	24		DE			
1-73	7	12	1	ON	A 4	64	15

EXTENDING A SEQUENCE

YOU SHOULD ALWAYS END A SEQUENCE with a DE event, IF YOU PLAN TO HAVE THE SEQUENCE LOOP OR BE CALLED UP BY ANOTHER SEQUENCE. Otherwise you will get sequences playing on top of each other incorrectly. To correct the above example, let's add one more line at the end and make it a DE event.

Type E (RETURN). The computer will display the sequence again with a blinking cursor after line number 8. Enter a DE event with a value of 24.

MSR-ST	EVNT	TIME	CH	TYP	NOTE	VEL	DUR
1-73	7	12	1	ON	A 4	64	15
	8	24		DE			

List line 8 to verify that the sequence ends at the beginning of a new measure. Type L8 (RETURN). The computer should display:

MSR-ST	EVNT	TIME	CH	TYP	NOTE	VEL	DUR
2-1	8	24		DE			

INSERTING EVENTS

You may find at some point you wish to insert notes into the event list. If you want to insert notes at the beginning of a sequence type I. The screen will clear and a blinking cursor will appear after EVNT 1. You must enter data in the proper format as listed above. If you do not, the message INVALID ENTRY will flash at the bottom of the screen and the cursor will display at the beginning of the incorrect data. When thru with the current line press (RETURN). The computer will process the information and then display a value under MSR-ST and start a new line.

If you change your mind about the previous line you entered type C (CORRECT). The cursor will return to the beginning of the old line and you may change any data you wish. Change only what you need to, using the CRSR LEFT or RIGHT keys to move thru data that is correct. Press (RETURN) when thru correcting.

If you wish to insert only one event and keep the remainder of the sequence as recorded, YOU SHOULD NOTE THE TIMING OF THE FOLLOWING NOTES. AFTER YOU INSERT A NOTE, YOU MUST SUBTRACT ITS VALUE FROM A FOLLOWING NOTE TO KEEP THE TIMING OF THE SEQUENCE CORRECT.

MSR-ST	EVNT	TIME	CH	TYP	NOTE	VEL	DUR
1-1	1	0	1	ON	D 4	60	17
1-1	2	0	1	ON	D 5	68	17

1-1	3	0	1	ON	F#	4	50	16
1-1	4	0	1	ON	A	4	67	16
1-37	5	36	1	ON	D	4	34	15
1-61	6	24	1	ON	F#	4	60	16
1-73	7	12	1	ON	A	4	64	15

To insert a bass note before event 5, enter I4. The screen will clear and display the first four lines. Type in the desired data and press (RETURN). On the following line type an X to quit the INSERT mode. List the sequence again.

MSR-ST	EVNT	TIME	CH	TYP	NOTE		VEL	DUR
1-1	1	0	1	ON	D	4	60	17
1-1	2	0	1	ON	D	5	68	17
1-1	3	0	1	ON	F#	4	50	16
1-1	4	0	1	ON	A	4	67	16
1-13	5	12	1	ON	D	3	64	16
1-49	6	36	1	ON	D	4	34	15
1-73	7	24	1	ON	F#	4	60	16
1-84	8	12	1	ON	A	4	64	15

Note that the events from line 6 on are now all 12 clock counts later. To keep the rest of the sequence relative to its previous location, we should deduct 12 counts from the time in line 6. Move the cursor up to EVNT line 6 and change the TIME value from 36 to 24. List the sequence again.

MSR-ST	EVNT	TIME	CH	TYP	NOTE		VEL	DUR
1-1	1	0	1	ON	D	4	60	17
1-1	2	0	1	ON	D	5	68	17
1-1	3	0	1	ON	F#	4	50	16
1-1	4	0	1	ON	A	4	67	16
1-13	5	12	1	ON	D	3	64	16
1-37	6	24	1	ON	D	4	34	15
1-61	7	24	1	ON	F#	4	60	16
1-73	8	12	1	ON	A	4	64	15

The sequence is now identical to when we started except that one event has been added at line 5.

OVERDUB

The OVERDUB mode is basically the same as CREATE A NEW SEQUENCE except that the program will automatically play an existing sequence while recording the new sequence, and come out of RECORD when the end of the sequence you are overdubbing to is reached. You may then play the two sequences together and MERGE them if you like.

When you select the OVERDUB function the computer will respond with ENTER SEQUENCE TO OVERDUB TO. This must be a sequence that is already recorded, otherwise the computer will respond with NOT ASSIGNED TO SEQUENCE KEY and return to the main menu. Next the computer will ask ENTER SEQUENCE TO STORE OVERDUB. If you enter a key that already contains data, the computer will prompt SEQUENCE USED, ERASE? Answer with a yes if you wish to record over that sequence.

Next a list of six options will be displayed, where you can specify what type of events you wish to record. If you don't want to make any changes press (RETURN).

The next screen will be identical to the RECORD and PLAY screen, except as soon as you start to play the keyboard the sequence you wish to OVERDUB to will turn on. You may also turn on any other sequences you wish to hear as you record. When the end of the sequence you are overdubbing to is reached the program will switch from RECORD to PLAY and you will hear what you just recorded, along with the sequence you were overdubbing to.

You may OVERDUB a part on the same instrument that is playing back as long as you don't try to play more notes than the instrument is capable of handling.

STEP-TIME RECORD

To CREATE A SEQUENCE in STEP-TIME, select option 2. Now select ENTER IN STEP-TIME, option 2. If your synth is receiving MIDI data on a different channel than it is sending ENTER the ECHO CHANNEL, otherwise press (RETURN).

The STEP TIME ENTRY menu will be displayed. On this screen are three rows consisting of TIME (time between events), DURATION (length of time that note is held down), and VELOCITY (how quickly the note will be attacked. In each column there is one black circle. You may select one parameter in each column by selecting the corresponding key.

To create a scale of staccato quarter and eighth notes, select 9 for quarter notes, a G to make duration very short, and an X for a quick velocity time.

As you play each note on the synth KBD, the values currently selected on the monitor are assigned to the pitch you specify. After playing the first few notes of the scale change the time to 8th notes by pressing 6 under the TIME column.

After a few more notes move the TIME back to quarter notes and make the DURATION longer. When you've reached the end of the scale enter a half notes rest by changing the TIME to C and pressing F5 for a REST.

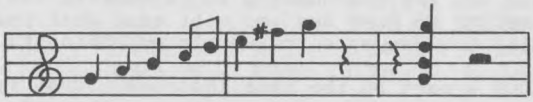
Create a chord in STEP-TIME by holding down the first note as you play additional notes. Continue to hold each note down until you've finished the chord. Then release all notes.

You may hear what you have recorded by pressing F7. To hear it again, press the Z key. You may continue recording more notes or quit.

Press F1 two times to return to the MAIN MENU.

LISTING A STEP-TIME SEQUENCE

Now select OPTION 3 - EDIT SEQUENCE. Type 1 (RETURN) in response to ENTER SEQUENCE KEY. The EDIT screen will display fourteen options to choose from; select L - LIST AND EDIT. A scale in the key of G, followed by a chord, might look like:



Listing the Sequence would reveal:

MSR-ST	EVNT	TIME	CH	TYP	NOTE	VEL	DUR
1-1	1	0	1	ON	G 3	96	2
1-25	2	24	1	ON	A 3	96	2
1-49	3	24	1	ON	B 3	96	2
1-73	4	24	1	ON	C 4	96	2
1-85	5	12	1	ON	D 4	96	2
2-1	6	12	1	ON	E 4	96	2
2-25	7	24	1	ON	F# 4	96	23
2-49	8	24	1	ON	G 4	96	23
3-25	9	72	1	ON	G 3	96	23
3-25	10	0	1	ON	B 3	96	23
3-25	11	0	1	ON	D 4	96	23
3-25	12	0	1	ON	G 4	96	23
3-73	13	48		DE			

CONTROL SEQUENCES

Control Sequences are created using the TYPE FROM COMPUTER mode of RECORD or by EDITING an existing Sequence. Control Sequences are used to 'play' other Sequences, by specifying a SEQUENCE START EVENT.

Suppose you had recorded two sequences which consisted of a bass line, Sequence B, and a piano line, Sequence P. Now you want to Overdub a melody line. You could create a CONTROL SEQUENCE which would play both of these sequences by:

MSR-ST	EVNT	TIME	CH	TYP	NOTE	VEL	DUR
1-1	1	0		B	0	0	1
1-1	2	0		P	0	0	1W
1-1	3	0		DE			

After you had Overdubbed your melody line (Sequence M), you could add it to this CONTROL SEQUENCE so that it would actually turn on three separate Sequences.

MSR-ST	EVNT	TIME	CH	TYP	NOTE	VEL	DUR
1-1	1	0		B	0	0	1
1-1	2	0		M	0	0	1
1-1	3	0		P	0	0	1W
1-1	4	0		DE			

CONTROL SEQUENCES may chain several levels deep if you wish. That is, one CONTROL SEQUENCE may call another CONTROL SEQUENCE. You should however, end CONTROL SEQUENCES with DE events.

The Sequence that is called up may have its number of REPEATS changed, and the PITCH and VELOCITY transposed. These changes are all independent of the Sequence as it was originally recorded.

The REPEAT value is placed under the DUR column.

The VELOCITY amount is placed under the VEL column.

The PITCH TRANSPOSE amount is placed under the NOTE column.

A WAIT command may also be invoked which will force the computer to finishing playing the current sequence before moving on to the next event in the sequence. The WAIT command is used by placing a W after the number of REPEATS in the DUR column.

MSR-ST	EVNT	TIME	CH	TYP	NOTE	VEL	DUR
1-1	1	0		A	0	0	1
1-1	2	0		B	12	0	1
1-1	3	0		C	0	-20	1
1-49	4	48		D	0	0	3W
1-49	5	0		DE			

In this example Sequence A plays one time. Sequence B plays once and is transposed up one octave. Sequence C's volume will be much softer (-20 in the VEL column), and Sequence D will play 3 times. The W will force the program to finish the 3 repetitions before going to the fifth event of DE.

SAVING SEQUENCES ON DISK

From the main menu press 7 - OTHER OPTIONS. Next press 7 again - SAVE DATA TO DISK. The computer will ask SAVE ALL SEQUENCES? Enter a Y. The computer will prompt ENTER FILE NAME: Type in an appropriate title. If you have already saved or loaded a file name the computer will display this. If you wish to use this same name press (RETURN). Otherwise type a new name making sure to type spaces over any old remaining letters if the previous file had a longer name.

If a file already exists on the disk with the same name the computer will ask if it should replace this file. Respond with a Y if you wish to write over the old file. Answering with anything response other than Y will return to the main menu.

You should now save any Sequences you may want to keep.

PLAY

The PLAY option will display all sequences that have been recorded. It will also allow real-time transposing of up to nine sequences simultaneously.

Load one of the DEMO programs to see PLAY in action. Select OTHER OPTIONS by pressing 7. and then LOAD DATA FROM DISK - option 6. The program will prompt LOAD ALL SEQUENCES? Press Y and then enter the file name DEMO1. After loading the DEMO1 file, the MAIN MENU will appear.

The demonstration pieces (DEMO1 and DEMO2) were written by Al Hospers and are (C) Copyright 1985, Al Hospers, all rights reserved. DEMO1 is a three part fugue which uses one of the structural capabilities of the software to make the fugue 'recursive', that is, with each repetition, the piece is played in a new key.

DEMO1 is set up to play on three MIDI instruments assigned to channels 1 - 3. If you have three MIDI instruments, set them up as follows:

VOICE #	INSTRUMENT	MIDI CHANNEL
1	flute	1
2	trumpet	2
3	cello	3

Press the PLAY option. The screen should look like:

```
S RE NAME      P F W S RE NAME      P F W
- -- --------  - - - - -- --------  - - -




                          C 1
D 99




                          Q 1  VOICEONE
R 1  VOICETWO
                          U 1  VOICETHR

Z 1  U                    MEASURE
REAL-TIME SEQUENCES: 12
+ PI  1    - PI  2    £ PI  4    H PI  7
D PI 12    @ VE  6    * VE 12    ↑ VE 24
R DU  1    C DU  3    C DU  6
READY 124 BEATS/MINUTE     F1 TO EXIT
```

As we can see from the PLAY screen there are only five sequences in DEMO1. Sequence D will repeat indefinitely while the other sequences will only play one time.

To hear the piece, press C. Sequence C will play Sequences Q, R, and U; wait for 1 1/2 measures, then call Sequence D which is transposed up one key and immediately starts playing Sequence C again. Each repetition will be in a new key. After playing the piece a few times, go back and LIST each sequence individually.

While DEMO1 is playing, the MEASURE counter will advance and letters and numbers will appear under the P F W columns, telling us the status of each sequence. As the piece plays, the screen may look something like:

```
S RE NAME     P F W S RE NAME     P F W
- -- -------- - - - - -- -------- - - -




                      C             1   W
D 99




                      Q             1 C
R             1 C
                      U             1 C


Z 1  U                MEASURE     9
REAL-TIME SEQUENCES: 12
+ PI  1   - PI  2   £ PI  4   H PI  7
D PI 12   @ VE  6   * VE 12   ↑ VE 24
R DU  1   C DU  3   C DU  6
READY 124 BEATS/MINUTE    F1 TO EXIT
```

Once a sequence is played, it's name is erased, so that any real-time transposes can be displayed. The transposes that we will hear in this piece are programmed however. The four sequences that are currently playing have a "1" under the P column, signifying they will play one time.

Three of the sequences - Q R U have a "C" under the F (FROM) column. This tells us they are being called from sequence C. Sequence C is a Control Sequence.

Also Sequence C has a "W" under its W (WAIT) column. Thus Sequence C can't end or pass control on until one of the sequences it has called finishes all its repeats.

Listing Sequence C will show the following:

MSR-ST	EVNT	TIME	CH	TYP	NOTE	VEL	DUR
1-1	1	0		U	0	0	1
1-1	2	0		Q	0	0	1
1-1	3	0		R	0	0	1W
2-49	4	144		D	2	0	1

Sequences U, Q, and R all begin playing immediately. The WAIT (the W at the end of EVNT line 3) will prevent the start of the fourth event until Sequence R has finished playing.

After 144 counts (1 1/2 measures Sequence D will begin playing. Sequence D is transposed up in Pitch one key.

Listing Sequence D will show the following:

MSR-ST	EVNT	TIME	CH	TYP	NOTE	VEL	DUR
1-1	1	0		C	0	0	1

Sequence D does nothing more than call Sequence C again. But Sequence D passes the Pitch transpose value back to Sequence C again and on each repetition the pitch is raised one key.

Feel free to EDIT the sequences. You can always retrieve the file from disk again if you alter the sequences too much.

REAL-TIME TRANSPOSE OF SEQUENCES

When using REAL-TIME TRANSPOSE, the Sequence NAME will be replaced by three columns displaying the current PITCH, VELOCITY, and DURATION values. Pushing one of these 11 keys will instantly transpose the REAL-TIME SEQUENCES.

```
REAL-TIME SEQUENCES: 12
+ PI  1   - PI  2   £ PI  4   H PI  7
D PI 12   @ VE  6   * VE 12   ↑ VE 24
R DU  1   C DU  3   C DU  6
READY 124 BEATS/MINUTE    F1 TO EXIT
```

The fifth from the bottom line tells us that currently Sequences 1 and 2 are set up to REAL-TIME TRANSPOSE.

REAL-TIME SEQUENCES: 12

USE the LEFT ARROW key to move the range of REAL-TIME SEQUENCES down, or the 0 key to move the range up. Pressing 0 once would move the range up to:

REAL-TIME SEQUENCES: 23

Pressing the LEFT ARROW three times would shift the range down to

REAL-TIME SEQUENCES: XY

Any of the default values may be shifted. All transposes could be made to shift PITCH if desired. REAL-TIME transpose defaults are selected during the INITIALIZATION menu.

The REAL-TIME TRANSPOSE default values are:

+	transpose PITCH	1
-	transpose PITCH	2
LB	transpose PITCH	4
C(CLR/HOME)	transpose PITCH	7
D(INST/DEL)	transpose PITCH	12
@	transpose VELOCITY	6
*	transpose VELOCITY	12
UP ARROW	transpose VELOCITY	24
(RETURN)	transpose DURATION	1
CRSR U/D	transpose DURATION	3
CRSR L/R	transpose DURATION	6

DELETING ALL SEQUENCES

When you are ready to start your own piece you should use the DELETE option from menu 2 to clear the SEQUENCER MEMORY. Since there is no global CLEAR memory command for the SEQUENCER, you may want to create an EMPTY song if you will be regularly working on more than one piece in a session.

To create an EMPTY song, delete all current sequences. Check DISPLAY SEQUENCE MEMORY to be sure, there should be 3550 events left. Save this as a song, and name it EMPTY. Whenever you need to CLEAR all the memory, load this piece.

INITIALIZATION

Each time you load the KEYBOARD CONTROLLED SEQUENCER you must INITIALIZE the system first. The INITIALIZE program can define and reset any of the default values used in the program, specify the type of CLOCK you want to use, etc. The default values you select are valid until you change them or turn off the computer. You may return to INITIALIZATION from the MAIN program to make changes without losing your sequences.

After loading the program the INITIALIZATION menu will display six options. Select an appropriate key 1 - 5 to change any default values. When through making changes, Press key 0, (RETURN), or the (SPACEBAR) to run the MAIN PROGRAM.

INITIALIZATION OPTIONS:

0. RUN MAIN PROGRAM
1. CLOCK FUNCTIONS
2. STEP-TIME ENTRY OPTIONS
3. REAL-TIME TRANSPOSE FUNCTIONS
4. DISK DIRECTORY
5. CHANGE COLORS

0. RUN MAIN PROGRAM loads and runs the KEYBOARD CONTROLLED SEQUENCER using the current default values. Make sure the DR. T PROGRAM disk is in the Commodore drive.

1. CLOCK FUNCTIONS displays four clock options and their current default values:

1. SENDING MIDI CLOCK
2. EXTERNAL CLOCK = PULSE (on SCI version)
or
2. NOT TOGGLING START/STOP (all other interfaces)
3. 1 EXTERNAL CLOCKS PER STEP
4. METRONOME EVERY 24 STEPS

You may change any option by selecting the appropriate number. (RETURN) exits back to the main INITIALIZATION menu. The Sequencer defaults to using the computer's INTERNAL clock. Use the CHANGE CLOCK option in the main program to select the EXTERNAL clock.

1. SENDING MIDI CLOCK toggles between sending or not sending one MIDI clock for each step of the clock (internal or external) that is controlling the Sequencer. This allows MIDI drum machines or synths (which have sequences programed into their own memory), to play in time with the KEYBOARD CONTROLLED SEQUENCER. MIDI clock events may also be sent from within a specific sequence (using a * event - see USEFUL MIDI COMMANDS - CHAPTER 7).

2. EXTERNAL CLOCK = PULSE (for SCI version). This option toggles between MIDI or PULSE for the external clock. The SCI interface can accept either. You should use PULSE if your hardware can provide it.

2. NOT TOGGLING START/STOP (for all other interfaces) toggles between leaving the START/STOP line high while the sequence is running or sending a pulse on the START/STOP line whenever the INTERNAL CLOCK starts or stops. The PASSPORT interface only accepts an external clock from MIDI. It will output a pulse clock, and also a START/STOP signal.

The default condition is that the start line is turned high when the INTERNAL clock is started, and turned low when the INTERNAL clock is stopped. This is required to run Roland and Korg Drum machines where the clock is continuously running and a separate START/STOP is needed to activate the machine. See CHAPTER 7 - 75 for more information.

3. 1 EXTERNAL CLOCKS PER STEP allows you to sync with drum machines having other than 24 steps/quarter note (PULSE SYNC IN or OUT). The default value is 1 clock per step.

If your drum machine produces 48 steps/quarter note, then EITHER set the external clocks/step to 2 OR set steps/measure to 192 (MENU 2 of main program).

With a 96 steps/quarter clock, EITHER set clocks/step to 4 OR change clocks/steps to 2 AND steps/measure to 192. You can gain extra resolution in the Sequencer by setting the steps/measure to 192 and NOT changing the clocks/step. The program will then respond as if every drumbox measure is actually two measures.

With the Passport interface, this option enables the program to generate one Sequencer step for any selected number of INTERNAL CLOCK steps. The Passport Interface generates one pulse clock out for every two INTERNAL CLOCK steps. By generating only one Sequencer step for every two INTERNAL CLOCK steps, you can sync your sequences with a drum machine driven by the external clock. See the Chapter on TROUBLE SHOOTING for more details.

4. METRONOME EVERY 24 STEPS changes the metronome rate. During RECORD and OVERDUB a visual metronome appears in the lower right hand corner of the screen and an audio click is sent to the monitor from the computer's audio/video connector. A value of 24 produces a pulse every 1/4 note, while a value of 12 produces a pulse every 1/8 note.

Some versions of the program may support the sync-to-tape feature available on some Passport and Syntech interfaces. These will display a slightly different set of options.

2. STEP-TIME ENTRY FUNCTIONS

With STEP-TIME ENTRY you can enter music using the computer KBD to specify timing and the synth KBD to specify note values. Dynamics (velocity) may be specified by either KBD. In STEP-TIME ENTRY there are 15 values for time specification, 15 values for duration and 6 values for velocity. Any of these default values may be changed by the user except for the Z velocity key which specifies velocity received from the synth KBD.

When the STEP-TIME ENTRY FUNCTION is selected, the computer will guide you thru the process of changing default values. Select the key you wish to change, enter a value (1 - 127) and (RETURN). A second (RETURN) or (SPACE BAR) returns to the main INITIALIZATION menu.

Note that the standard default TIME factors correspond to the most commonly used note values, including triplets and dotted notes, while DURATION factors are 1 count shorter than the corresponding TIME factors.

To AVOID NOTES GLITCHING, you should keep the DURATION value at least 1 count shorter than the TIME, when a note is repeated, or the sequence is being played monophonically. If the same note is to be turned off and on in the same time step, the program may turn the new note on before it shuts the old note off. This can result in undesirable and sometimes unpredictable effects on some synthesizers.

3. REAL-TIME TRANSPOSE FUNCTIONS

There are 11 real-time transpose keys which can control up to nine consequtive Sequence Keys during PLAY. All 11 of these keys may be re-assigned new transpose types and amounts. Select the key you wish to change by using the number on the real-time menu, and then specify transpose type (P)itch, (V)elocity or (D)uration and transpose amount (0 - 63).

Option 12 and option 13 work together. Option 12 will control the rate at which you 'move' the RANGE of sequences that are affected by the TRANSPOSE functions. Option 13 will determine how many sequence keys (1 - 9) are affected by the TRANSPOSE functions.

For example, if you entered a 3 for option 13 then only 3 sequence keys would be transposed. This would be displayed near the bottom of the PLAY screen as:

REAL-TIME SEQUENCES:123

Leaving option 12 default value at 1 would cause the LEFT-ARROW key when pressed during the PLAY mode to shift the range down by one. The display would show:

REAL-TIME SEQUENCES:Z12

The range will 'wrap around.' Pressing the 0 key 3 times would change the display to:

REAL-TIME SEQUENCES:345

Thus Sequence keys 3 - 5 would be affected by any transpose keys that were pressed.

If you set Option 12 (Sequence RANGE) to 5 and Option 13 (NUMBER of Sequences) to 6 and then enter the PLAY mode the display would read:

REAL-TIME SEQUENCES:123456

Pressing 0 (shift to right) would alter the display to read:

REAL-TIME SEQUENCES:6789AB

Only the Sequence Keys selected by option 13 are affected by the TRANSPOSE keys. The initial default value is Sequence 1 and 2. These transposes are temporary, they will have no effect on subsequent playing of the sequences. For the TRANSPOSE feature to work, at least one of the sequences (specified by option 13) must be PLAYING or WAITING when a transpose key is pressed.

Option 14 turns off the TRANSPOSE display. This prevents the program from erasing the sequence names and repeat factors once PLAY has been activated. Entering 14 again will toggle this option on and off. All TRANSPOSE functions still work. UNTIL YOU ARE READY TO USE REAL-TIME TRANSPOSE, YOU SHOULD TURN OFF THE TRANSPOSE DISPLAY TO AVOID CONFUSION.

Option 15 turns off the TRANSPOSE defaults at the bottom of the screen, reducing visual clutter. All TRANSPOSE functions still work. If you are not using REAL-TIME TRANSPOSE, turn this display off also.

4. DISK DIRECTORY

The disk directory list is done from BASIC. ALL SEQUENCE DATA IN MEMORY WILL BE LOST WHEN YOU LIST THE DIRECTORY! If you have not saved your sequences, return to the main program and do so. After selecting the directory option:

1. Place disk to read in the drive.
2. Press RUN/STOP. The cursor will be positioned at
   LOAD"$",8

3. Press (RETURN). When the disk drive stops the cursor will be positioned at LIST.
4. Press (RETURN). All files will be displayed.
5. To return to INITIALIZATION, insert PROGRAM disk and
6. Type LOAD"I",8 (RETURN)
7. Type RUN (RETURN)

All files on the disk will be displayed. Single sequence files begin with the prefix SQ. and songs or files of all sequences begin with SQALL.

You do not have to specify SQ. or SQALL. when loading files into the program. You should make a list of saved sequences and attach it to the disk jacket for future reference. BE SURE TO INSERT THE PROGRAM DISK before attempting to restart.

5. CHANGE COLORS

You may change the foreground, background and border colors to any of the 16 colors available on the COMMODORE by entering the values 0 - 15. The FOREGROUND COLOR is the color used by the program to display text. The sixteen colors available are:

0	1	2	3	4	5	6	7
black	white	red	cyan	purple	green	blue	yellow
8	9	10	11	12	13	14	15
orange	brown	lt.red	gray1	gray2	lt.green	lt.blue	gray3

By specifying the same background and border color, you can create a two-tone display. If you make a bad color choice, it may impossible to read the monitor. Try adjusting brightness and contrast so you can get back to the CHANGE COLOR option.

MAIN MENU - OPTION DESCRIPTIONS

The MAIN MENU contains the following options:

1. PLAY
2. CREATE NEW SEQUENCE
3. EDIT SEQUENCE
4. COPY/APPEND SEQUENCES
5. MERGE SEQUENCES
6. OVERDUB
7. OTHER OPTIONS

1. PLAY

PLAY is selected by pressing 1 or P (PLAY) on the keyboard. A new screen displays all Sequences thus far recorded. You may PLAY all Sequences in real-time. You can also transpose the pitch, velocity, and duration of any Sequences (defined during the INITIALIZATION process) in real-time.

When PLAY is selected a new screen appears which is similar to the real-time RECORD and OVERDUB screens. At the top of the PLAY screen will be the following heading:

S RE NAME P F W S RE NAME P F W

Two columns of information concerning the sequences that have been previously recorded will appear below this heading. Initially, when the screen comes up, nothing appears under the P F W headings. The meanings of the data displayed under the different headings are given below:

S = Sequence key (1 - 9) or (A - Z).
Only RECORDED Sequence keys will be displayed.

RE = the number of times a sequence will REPEAT when played from computer KBD.
A value of 99 indicates sequence will play indefinitely.
RE will be erased to show REAL-TIME TRANSPOSES when sequence is played.

NAME = the NAME given to a Sequence during EDITING.
NAME will be erased to show REAL-TIME TRANSPOSES when sequence is played.
you may disable erasure during INITIALIZATION (see Chapter 3, pages 28 - 29).

The P, F, and W columns will remain blank, unless the sequence is currently playing.

P = the number of plays remaining.
1 indicates the sequence is in it last cycle.
9 indicates the sequence has 9 or more plays left.

F = FROM where a Sequence is being called. The value displayed represents the activating Sequence key. Remains BLANK if called by COMPUTER KBD.

W = W indicates the Sequence has encountered a WAIT command.
M indicates this Sequence has been MUTED.
a BLANK indicates sequence is not WAITING or MUTED.

The PLAY SCREEN for the song DEMO2 looks like this:

```
S RE NAME      P F W S RE NAME      P F W
- -- -------- - - - - -- -------- - - -


                          C 1  CONTROL
D 1  INTRO/HR             E 1  END


J 1  MEL/2
L 1  MEL/1                M 1  MEL1/HAR


R 1  BASS2                S 1  SONG      1
                          U 1  INT/BASS
                          W 2  BASS/1

Z 1  C                    MEASURE
REAL-TIME SEQUENCES: 12
+ PI  1    - PI  2    £ PI  4    H PI  7
D PI 12    @ VE  6    * VE 12    ↑ VE 24
R DU  1    C DU  3    C DU  6
READY 124 BEATS/MINUTE     F1 TO EXIT
```

Once we begin playing the song (pressing key C), Sequence names will be erased, and numbers and letters will appear in the P, F, and W columns. In its eighth measure of play, the PLAY SCREEN would look like this:

```
S RE NAME      P F W S RE NAME      P F W
- -- --------- - - - - -- --------- - - -




                                    C              1   W
D 1                                 E 1  END

J 1  MEL/2
L 1  MEL/1                          M              1 C

R 1  BASS2                          S
                                    U
                                    W              1 C

Z 1  C                              MEASURE      8
REAL-TIME SEQUENCES: 12
+ PI  1    - PI  2    £ PI  4    H PI  7
D PI 12    @ VE  6    * VE 12    ↑ VE 24
R DU  1    C DU  3    C DU  6
READY 124 BEATS/MINUTE     F1 TO EXIT
```

Sequences C, M, and W are currently playing. Sequence D, S, and U have played thru and stopped. Sequence C also has a WAIT command currently active.

The bottom line of the play displays the INTERNAL CLOCK rate:

READY 124 BEATS/MINUTE F1 TO EXIT

If you have selected the EXTERNAL CLOCK option, 124 BEATS/MINUTE will be replaced by EXTERNAL CLOCK. Do not attempt to play any Sequences until the screen is complete. You may select several Sequences first and then turn on the drum machine. No music will play until the drum machine begins.

During PLAY, when using the INTERNAL CLOCK:

The , key will INCREASE the clock rate.
The . key will DECREASE the clock rate.

The display will not be updated however. The clock rate may also be programmed from within a Sequence. See CHANGE CLOCK option - CHAPTER 5 - 62.

TO PLAY A SEQUENCE

Press the corresponding Sequence key on the computer keyboard. If you are using an EXTERNAL CLOCK (drumbox), the Sequence will begin playing as soon as the drum machine is started. As the Sequence plays through its loops, the value under R (REPEAT factor) will be decreased by one until it reaches "1", after which it will shut off.

Any number of Sequences may be played at one time, and several Sequences may be sent to the same instrument. If you attempt to send more voices to an instrument than are available, not all voices will play. The results will depend on the design of the particular instrument you are using.

CONTROLLING THE REPEAT FACTOR

During PLAY, you can defeat the number of REPEATS for a Sequence by pressing its represented key. The number of REPEATS will be set to 1 and then play for one final cycle. If the Sequence is already in it's last cycle, it will immediately shut off.

To SHUT OFF A SEQUENCE that has 2 or more REPEATS, press its key twice.

VAMPING

The F7 or FOOTSWITCH places any Sequences currently playing (in the range 1 - 9), into their last cycle.. This is very useful for vamping or playing live. You may set up several sections with 99 REPEATS; this will allow you to 'solo' and then hit the FOOTSWITCH when you're ready to move to the next set of sequences.

MUTE AND UNMUTE

To MUTE a sequence, press SHIFT and the Sequence key simultaneously. An M will appear under the W heading for the Sequence. The Sequence will continue to step in time, but no events will be sounded. Notes currently playing will be shut off unless they were defined with DURATION 0 and separate NOTE OFF events. These notes will be stuck on and will have to be reset locally on the instrument.

To UNMUTE a Sequence, press the Sequence key again (no SHIFT) this time. The M will disappear and the Sequence will resume sounding at the same point it would have been at, had the MUTE feature not been invoked. Use MUTE to cue in and out multiple overdubs in real-time, or to isolate and listen to individual tracks.

REAL-TIME TRANSPOSE

Near the bottom of the Screen appears the phrase:

REAL-TIME SEQUENCES:12

These are the SEQUENCE KEYS WHICH MAY BE TRANSPOSED IN REAL TIME as the SEQUENCER plays. Initially there will be two Sequences 1 & 2, unless the default values of the REAL-TIME TRANSPOSE FUNCTIONS were changed during INITIALIZATION.

Change which Sequence keys will be affected by the REAL-TIME TRANSPOSE, by pressing the LEFT ARROW to lower the range and the 0 key to raise the range. The new set of keys will be displayed next to REAL-TIME SEQUENCES: From INITIALIZATION, you may change the amount of range for the LEFT ARROW and 0 keys.

The next three rows display 11 keys which perform PITCH, VELOCITY, and DURATION transposes to Sequences as they are playing. These transposes are temporary, and are not remembered by the SEQUENCER after exiting the PLAY mode. You may change any value by going back to the INITIALIZATION menu.

REAL-TIME TRANSPOSE DEFAULT VALUES

KEY	TRANSPOSES	AMOUNT
+	PITCH	1 half-steps
-	PITCH	2 half-steps
LB	PITCH	4 half-steps
C(CLRHOME)	PITCH	7 half-steps
I(INSTDEL)	PITCH	12 half-steps
@	VELOCITY	6 units
*	VELOCITY	12 units
UPARROW	VELOCITY	24 units
(RETURN)	DURATION	1 unit
CRSR U/D	DURATION	3 units
CRSR L/R	DURATION	6 units

Pressing the desired TRANSPOSE key will transpose the current Sequence up by the above specified amount. A (SHIFTED) TRANSPOSE key will transpose the corresponding value down.

A (SHIFTED) F1, F2, and F3 will reset PITCH, VELOCITY and DURATION TRANSPOSES to 0.

REAL-TIME TRANSPOSES will be added to any transpose assigned to the Sequence through a CONTROL event.

During PLAY, the Sequence NAME will be erased to display the current TRANSPOSE VALUES for PITCH, VELOCITY, and DURATION.

You may suppress displaying either the current Sequence TRANSPOSE VALUES or the TRANSPOSE VALUES at the bottom of the screen from the INITIALIZATION, if you do not plan to do real-time transposing.

FUNCTION KEYS IN PLAY

The FUNCTION keys work differently in various modes of the Sequencer. See FUNCTION KEYS (in Index) for a full description.

F1 EXITS to the MAIN MENU, shutting off all notes before leaving the PLAY mode.

(SHIFT) F1 resets any real-time PITCH transposes set-up during PLAY.

F3 ALIGNS Sequences called from the computer keyboard to start at the beginning of the next measure. The start of the next measure is computed by counting steps from the start of the first Sequence played, and assumes that the number of steps in a measure is the value set using menu option M.

(SHIFT) F3 resets any VELOCITY transposes set-up during Play.

F5 CANCELS all active sequences. TURN OFF THE DRUMBOX FIRST then the F5 key if you wish to restart your sequences in sync. If you did press F5 before stopping the drum machine, press F5 again.

When using the INTERNAL CLOCK, be aware that F5 also shuts off the INTERNAL CLOCK. You must press the SPACEBAR to restart the clock after pressing F5. You may use this method to start several Sequences at once.

If sequences were created using separate NOTE ON and OFF events (DURATION 0) and you use F1 or F5 after a NOTE ON event but before the corresponding NOTE OFF event, the note will be 'stuck' on. You must locally reset the instrument by pressing a new Program.

(SHIFT) F5 resets any DURATION transposes set-up during Play.

F7 and the FOOTSWITCH shut off any multiple repeats that are set up for Sequences 1 - 9. Use this to exit from a vamp section. When activated, the current REPEATING Sequences will be put into a last cycle, play thru one more time, and then shut off. The P field (times left to PLAY) will not change immediately.

STARTING SEVERAL SEQUENCES SIMULTANEOUSLY

When using the INTERNAL CLOCK, timing starts when you press a Sequence key. To start several Sequences using the INTERNAL CLOCK, press F5, one or more Sequence keys, then the SPACE BAR. A drumbox being driven by the computer's INTERNAL CLOCK will also be started when you hit the SPACE BAR.

If a drum machine is providing the EXTERNAL CLOCK, press F5 to clear the computer, enter the Sequence keys and then turn on the drum machine.

2. CREATE NEW SEQUENCE

When CREATE NEW SEQUENCE is selected the computer will respond with ENTER SEQUENCE KEY. Press one key (1 - 9) or (A - Z), or a 0 (to quit the Recording process) followed by (RETURN). If you have previously recorded on a specified Sequence, the computer will prompt, SEQUENCE USED, ERASE? Y will signify yes and any other key will bring you back to the MAIN MENU.

The Z key should normally not be used for a Sequence, unless there are no other available keys left. The Z key is set aside by the computer as a temporary ALTERNATE KEY ASSIGNMENT. You may use the Z key to PLAY the current Sequence while in RECORD or EDIT, but this function will no longer be available once Z has been RECORDED.

The computer automatically puts a new Sequence at the beginning of the longest block of free space UNLESS you enter * (RETURN) before specifying the desired Sequence key.

After you have selected a Sequence key, the following screen will appear.

```
NEW SEQUENCE OPTIONS
1.   RECORD IN REAL-TIME
2.   ENTER IN STEP-TIME
3.   TYPE FROM COMPUTER
ENTER OPTION:
```

Select option 1 - 3 or press (RETURN) or the (SPACEBAR) to default to option 1.

RECORD IN REAL-TIME records events from your synthesizer keyboard. In this mode the program is similar to an analog tape recorder, recording all notes as you play.

ENTER IN STEP-TIME creates a Sequence using a method similar to step-time entry on a drum machine. You specify the time between events and note duration from the computer KBD and the

pitch value from the synth KBD. Velocity may be specified from either KBD.

TYPE FROM COMPUTER creates an event list containing all Sequence parameters including note on and off values, duration, velocity, program and control changes. You can also use TYPE FROM COMPUTER to build a CONTROL SEQUENCE which calls up already recorded Sequences in a desired order. This procedure is similar to the CHAIN or BUILD SONG mode on a drum machine.

When a NEW SEQUENCE is created, the REPEAT count is automatically set to 99. It may be changed during EDIT.

REAL-TIME RECORD OPTIONS

Selecting REAL-TIME RECORD brings up a list of 6 more options. Each option is followed by a 0 to signify OFF or a 1 to signify ON. These options and their normal default values are:

1	COMPUTER	0	Record Sequence events from computer KBD.
2	MIDI	1	Record MIDI keynote events.
3	NON-KEYBOARD	0	Record other MIDI events, such as pitchbend, control changes, & program changes.
4	AFTER-TOUCH	0	Record after-touch events (pressure).
5	NOTES OFF	0	Store note off events separately from note on events.
6	ECHO CHANNEL	0	Echo all selected MIDI events to another MIDI channel.

The first five options may be toggled ON/OFF by selecting the appropriate option number and (RETURN). To change the ECHO CHANNEL, select 6, (RETURN) and then a number from (1 - 16). Enter 0 to toggle ECHO CHANNEL off.

DEFINITION OF REAL-TIME RECORD OPTIONS

1. COMPUTER - The Computer reads its own keyboard and records when a Sequence key is depressed. Any key depressed which has been assigned to a previously recorded Sequence will begin playing that Sequence immediately. You can use this option to create a CONTROL SEQUENCE in real-time.

2. MIDI - Records MIDI Note on and Note off keyboard events. Normally you would leave this on unless you want to record only computer events.

3. NON-KEYBOARD - Records MIDI control events such as Program Changes, Mod Wheel Changes, Pitchbend, and Footpedal. Note that MIDI OPTION #2 MUST BE ON. RECORDING PITCHBEND & MOD WHEEL CHANGES USES UP MEMORY VERY QUICKLY.

4. AFTER-TOUCH - Records MIDI control events of After-touch or Pressure. This control is treated separately from option 3 because it is almost impossible to play a DX7 without sending some After-touch events. Recording After-touch uses up computer memory VERY FAST. Option 4 is only functional if Option 3 has been selected. NOTE that if Option 4 is off, control changes for parameter 3 on MIDI channel 1 (After-touch events on early DX7s) will also not be recorded.

5. NOTES OFF - Allows separate storage of Note off events. For optimum performance the SEQUENCER program was designed to play up to 16 notes simultaneously. If you need more notes, you must record these particular notes as separate NOTE ON and NOTE OFF events. If you want to record NOTE OFF VELOCITY, use this option.

6. ECHO CHANNEL - All MIDI events being recorded will be converted to and transmitted on the currently selected ECHO CHANNEL. This allows you to record with a remote keyboard in the Local Control Off mode, and hear what you are playing on any synthesizer connected to the Sequencer output. Note that not all synths can function in a Local Control Off mode, however and the ECHO CHANNEL feature works only while you are actually in the RECORD mode.

REAL TIME RECORDING

When you are finished selecting the desired options press (RETURN). The PLAY screen will now be displayed. All previously defined Sequences may be played, exactly as described under the PLAY option. You cannot RECORD until the full screen is displayed and the word READY is visible in the bottom left corner of the screen.

ALIGN

The ALIGN feature, activated by pressing F3 before you begin recording, will assure that your Sequence is a whole number of measures long. The word ALIGN will appear at the bottom of the screen and when you end the Sequence, the program will not actually stop recording until the current measure is completed.

Shut off the ALIGN feature by pressing F3 again. ALIGN is very useful because it keeps your sequences in time, but unlike the AUTO-CORRECT function it leaves the subtle timing variations played, within the Sequence intact.

If you do not wish to use ALIGN, you can correct the ending point of your sequence with EDIT or you can record an empty sequence of the proper length and OVERDUB to it.

USING THE EXTERNAL CLOCK

If you are using a drumbox, RECORDING WILL BEGIN WHEN THE DRUMBOX HAS BEEN STARTED and one of the following events occurs:

A MIDI NOTE ON event
Any other MIDI event (if the proper PB, CC, or AT option has been selected)
Any Sequence key on computer KBD has been activated
Hitting the FOOTSWITCH or F7 key

When using an EXTERNAL CLOCK, no sequence data can be recorded until the drum box is started. If you are using the INTERNAL CLOCK, the number of beats/minute will be displayed.

To start a Sequence with a REST, use the FOOTSWITCH or F7 key.

To start in SYNC with a drumbox program, press the F7 key BEFORE starting the drumbox.

To RECORD a part in SYNC to a previously recorded Sequence, hit F5 to CANCEL and reset any Sequences, then select the desired Sequence keys you wish to play along with before starting the drumbox. You may later edit out any timing errors at the beginning of the Sequence, or, indeed any errors of any type.

TO STOP RECORDING, press either F1, F5, F7, or the FOOTSWITCH.

FUNCTION KEYS IN REAL-TIME RECORD

F1 causes the Sequencer to stop RECORDING and returns to the MAIN MENU. The actual ending time will be stored. If you want the ALIGN feature to work properly, you must use F7, not F1, to end recording.

F3 ALIGNS the Sequence, causing the program to wait until the final measure has completed before ending the recording process.

F5 stops RECORDING, Sends a MIDI STOP event (even if the MIDI CLOCK is shut off), erases the current Sequence, and resets the program to RECORD the current Sequence again.

TO MAINTAIN SYNC WITH A NON-MIDI DRUMBOX program, hit the F5 key again after you turn off the drum machine.

F7 or the FOOTSWITCH causes Sequence RECORDING to end. If ALIGN is on, the program will continue RECORDING until the end of the current measure. The newly recorded Sequence will immediately PLAY back.

USING THE INTERNAL CLOCK

The INTERNAL CLOCK starts running when you begin RECORDING. A MIDI drum machine may be started when you begin RECORDING, provided you have left the MIDI CLOCK on in the INITIALIZATION section of the program.

F5 ERASES the current sequence, shuts off the INTERNAL CLOCK, and resets the program to re-record the current sequence. You must press the (SPACEBAR) to turn on the INTERNAL CLOCK before you may record again

TO RECORD IN SYNC with a drumbox program, hit F5 after you enter the RECORD mode. Hit F7 to start Sequence RECORDING and THEN hit the (SPACE BAR) to start the clock. The drum part will start playing and the delay between hitting the (SPACE BAR) and the first note played will be recorded as part of the Sequence.

STEP-TIME ENTRY

After selecting the ENTER IN STEP-TIME option you will be prompted with ENTER ECHO CHANNEL: Enter a value from 1 - 16 and (RETURN) to echo the MIDI data or enter 0 if you don't want to echo the MIDI input. You can default to the last MIDI value entered by pressing (RETURN) only.

The STEP-TIME MENU displays three columns. Listed are 15 choices for TIME separation between notes, 15 choices for note DURATION, and 6 choices for VELOCITY. The Z option under VELOCITY tells the program to accept velocity data from the synthesizer KBD.

Note that the TIME values are the most frequently used values including triplets and that the DURATION values are generally 1 count shorter than the corresponding TIME value. Some instruments will not respond properly if you repeatedly play a note that has a DURATION value equal to or longer than the TIME value.

Option 2 of the INITIALIZATION menu will change any of the STEP-TIME values without losing the sequences currently in memory. See INITIALIZATION - CHAPTER 3 - 28.

The current values are indicated by a filled in circle to the right of each column. TIME, DURATION, and VELOCITY values may be changed by at any time by pressing the corresponding key on the computer KBD. The notes played on the synthesizer KBD, will be recorded into memory with the current values displayed on the CRT.

A TIME change is normally NOT MADE UNTIL AFTER THE NEXT EVENT. If you play two notes and then make a TIME change, on PLAYBACK, three notes will play before the TIME changes.

Use F3 - RESET TIME to FORCE THE TIME CHANGE TO OCCUR ON THE NEXT NOTE. Enter notes at the first TIME value, change the TIME value, press F3, and then continue to enter notes.

To insert a REST, press F5. To insert a REST of a different time value, change TIME value, press F3, then press F5.

To create a TIME VALUE that is the sum of two menu values, select one value, press F3 - RESET TIME, select the other value, and press F5 - REST.

STEP CHORDS are created by holding notes down, and not releasing until all notes of the chord have been played. The program will record the time separation between notes as zero.

The FIRST NOTE of a STEP-TIME sequence will have a time of zero unless a rest has been entered.

FUNCTION KEYS IN STEP-TIME RECORD

The FUNCTION KEYS work slightly different during STEP-TIME recording.

F1 stops RECORDING and EXITS to the main menu.
F3 specifies that the new separation TIME applies to the next note. Press F3 AFTER changing the TIME value.
F5 inserts a REST.
F7 PLAYS the current Sequence one time.
Use the Z key to PLAY again.
Press F1 to escape PLAY and return to STEP-TIME ENTRY.

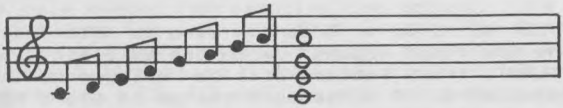
TYPE FROM THE COMPUTER KBD

The TYPE FROM THE COMPUTER KBD option allows you to precisely control every parameter of an event. You can specify when a note is to play, what MIDI channel to sound on, note pitch, velocity and duration. You may also direct to computer to play a previously defined Sequence.

When you first enter TYPE FROM COMPUTER KBD, the screen will look like:

MSR-ST	EVNT	TIME	CH	TYP	NOTE	VEL	DUR
	1	*					

You must supply values for columns 3 - 8. This is the slowest method of data entry, but also the most powerful in terms of control over the sequence.

In traditional music notation a C major scale followed by a chord looks like:

The TYPE FROM COMPUTER KBD event list would look like:

MSR-ST	EVNT	TIME	CH	TYP	NOTE	VEL	DUR
1-1	1	0	1	ON	C 4	64	11
1-13	2	12	1	ON	D 4	64	11
1-25	3	12	1	ON	E 4	64	11
1-37	4	12	1	ON	F 4	64	11
1-49	5	12	1	ON	G 4	64	11
1-61	6	12	1	ON	A 4	64	11
1-73	7	12	1	ON	B 4	64	11
1-85	8	12	1	ON	C 5	64	11
2-1	9	12	1	ON	C 3	64	24
2-1	10	0	1	ON	G 4	64	36
2-1	11	0	1	ON	E 4	64	36
2-1	12	0	1	ON	C 5	64	36
3-1	13	96		DE			

SEQ 1 99 REP 96 STEPS/MEAS

MSR-ST and EVNT are supplied by the computer. MSR-ST shows the time of an event relative to the beginning of the sequence. The value under MSR is the MEASURE in which the event occurs, and the value under ST is the STEP within the measure. A value of 1-1 indicates a note to be played immediately at the start of the sequence, a value of 2-13 indicates a note to be played at the 13th step of the second measure.

The number of steps in a measure may be altered by the CHANGE MEASURE/STEPS command (menu 2). The program is originally configured for 96 steps per measure or 24 steps per quarter note.

The value under EVNT is the number of the EVENT. You can specify a range of event numbers with most of the EDIT commands (LIST, PLAY, TRANSPOSE, COPY, etc.).

The TIME value is the number of clock steps which must elapse between the last event and the current event. Any number from 0 - 65535 is valid.

The following abbreviations may be used to simplify entry:

A - last value used	Q - Quarter note
W - Whole note	E - Eighth note
H - Half note	S - Sixteenth note

A (SHIFTED) W, H, Q, or E can be used to enter values that are 1/3 of the unshifted values. When the data line is sent by pressing (RETURN), these letters will be replaced by their numerical equivalents. A subsequent change in STEPS/MEASURE will not affect events already entered.

MSR-ST	EVNT	TIME	CH	TYP	NOTE	VEL	DUR
1-48	1	H	1	ON	C 4	80	21
1-60	2	E	1	ON	D 4	67	11

The value under CH signifies the MIDI channel on which this note is to be sent (1 - 16). Different MIDI channels may be specified in the same sequence.

MSR-ST	EVNT	TIME	CH	TYP	NOTE	VEL	DUR
1-1	1	0	4	ON	C 4	78	24
1-13	2	12	7	ON	D 4	64	31
1-25	3	12	5	ON	E 4	60	23
1-37	4	12	1	ON	F 4	45	8

TYP = TYPE of event. There are nine TYPES of events that may be recorded. Seven of these are MIDI and two are non-MIDI. A Sequence may contain different types of events. Not all synthesizers will respond to all of these events. The seven MIDI events that THE KEYBOARD CONTROLLED SEQUENCER recognizes are:

ON - note on
OF - note off (may be also be typed as OFF)
CC - control change
PG - program change
AT - after-touch or channel pressure
PB - pitch-bend
* - Single byte event

The two types of non-MIDI events are:

DE - deleted event or rest
any Sequence key - Sequence Start Event
(1 - 9 or A - Z)

VALUES FOR NOTE, VELOCITY and DURATION

The meanings of the VALUES entered under the NOTE, VELOCITY, and DURATION columns depend on which of the nine events is under the TYP column.

NOTE ON AND OFF

If the TYP is ON or OFF, the NOTE value will be a note from A - G followed by a number representing the octave. The MIDI keyboard covers over ten octaves, from C-1 to G9. Some instruments may not respond to this whole range. C4 would represent middle C (the third C on a DX7 or Six-trak). Use a # to denote raised notes. C5, D3 and G#4 are valid entries.

The value under VEL is the VELOCITY (the speed at which the note was played). The range is 0 - 127.

A DUR value will be displayed only for note ON events. The DUR value must be between 0 and 255. It is the number of clock steps for which the note is to be held down.

A note ON event with a DUR greater than 0 does not require a note OFF event.

A DUR value of 0 tells the program that the note is to be held down until a corresponding note OFF event occurs for the same key. Every note ON with a DUR of 0 must have a matching note OFF.

Duration 0 must be used if you need to hold down the note for more than 255 steps, if you need note OFF velocity, (T8 & Oberheim Expander), or if you need more than 16 notes held down at once.

MSR-ST	EVNT	TIME	CH	TYP	NOTE	VEL	DUR
1-1	1	0	4	ON	G 3	25	0
1-1	2	0	4	ON	E 4	94	0
4-1	3	384	4	OFF	G 3	69	0
4-1	4	0	4	OFF	E 4	64	0

In this example two notes are turned on and four measures later, both notes (G 3) are turned off.

CONTROL CHANGE

CC events are control events. They can be generated by a MOD wheel, MOD pedal, joystick, sustain pedal etc. A CC event of type 1 is normally generated by the modulation wheel (on a DX7 for instance). Another instrument may use a joystick for CC event type 1.

When the TYP event is a CONTROL CHANGE (abbreviated CC), the value under NOTE will represent the control parameter being changed. Each modulation device will have a different Control number. On a DX7, the sustain pedal = 64, Mod wheel = 1, Mod pedal = 4 etc.

Control parameter numbers differ between manufacturers, so consult your instrument documentation. Early DX7s use control parameter 3 for after touch, and will not respond to AT type events.

SIX-TRAK owners should note that all patch parameters can be changed through MIDI, separately for each voice if the instrument is in mono mode. See your Owners manual for details.

The value under VEL will be the new value for a control parameter. The range is 0 - 127, but only certain values may be valid for a particular instrument and type of CC event.

CC events do not use the DUR column.

MSR-ST	EVNT	TIME	CH	TYP	NOTE	VEL	DUR
1-1	1	0	1	ON	D 5	60	44
1-8	2	7	1	CC	1	2	
1-8	3	0	1	CC	1	4	
1-9	4	1	1	CC	1	6	
1-10	5	1	1	CC	1	8	
1-10	6	0	1	CC	1	10	

Control Change 1 = a MOD WHEEL. CC events take up large amounts of memory and it would take a long time to enter enough events with sufficient resolution to be effective. It would be easier to record CC events in REAL-TIME and MERGE them with the desired Sequence. However, it may be useful to program sudden changes in a control parameter to open a filter or turn on a vibrato.

PROGRAM CHANGE

If the event is a PROGRAM CHANGE, the value entered under Note would represent a new program number. NOT ALL INSTRUMENTS begin program numbering with 0. On a DX7, for example, the program number specified by the sequence should be 1 less than the number desired on the instrument.

Instruments which use the Bank feature to access programs generally use a format like 11-18, 21-28, 31-38 etc. In this case, calling program 0 from the Sequencer will set the synth to program 11; calling program 9 from the Sequencer will set the synth to program to 22.

PG events do not use the VEL or DUR columns.

MSR-ST	EVNT	TIME	CH	TYP	NOTE	VEL	DUR
1-1	1	0	4	PG	24		
1-1	2	0	2	PG	12		

AFTER TOUCH

If the TYP event is an AFTER TOUCH (or pressure), the NOTE value entered should be from 0 - 127. AT events use up lots of memory.

AT events do not use the VEL or DUR columns.

MSR-ST	EVNT	TIME	CH	TYP	NOTE	VEL	DUR
1-1	1	0	4	ON	F 4	109	184
1-2	2	1	4	AT	3		
1-2	3	0	4	AT	4		
1-3	4	1	4	AT	5		

PITCHBEND

The value entered under Note for PITCHBEND can be in the range of -8192 to 8191. MIDI specs allow 14 bits for pitchbend, hence the large numbers. Not all machines interpret these values similarly, so experiment and check your manual.

PB events do not use the VEL or DUR columns.

MSR-ST	EVNT	TIME	CH	TYP	NOTE	VEL	DUR
1-1	1	0	1	ON	C 5	91	31
1-11	2	10	1	PB	390		
1-11	3	0	1	PB	650		
1-11	4	0	1	PB	910		

PB events use up lots of memory also.

To conserve memory, you could record a sequence of CC, PB, or AT events separately and insert a SEQUENCE START EVENT whenever a modulation effect was needed.

SINGLE BYTE EVENTS

A SINGLE BYTE EVENT may be sent over MIDI by entering a * under event TYP and the byte value (0 - 255) under NOTE. You may send any system common or system exclusive information from your sequences. See CHAPTER 7 - 79.

In the following example, the single byte event would send a MIDI START command to all listening devices.

MSR-ST	EVNT	TIME	CH	TYP	NOTE	VEL	DUR
1-1	1	0	1	*	250		

IT IS THE USERS RESPONSIBILITY TO UNDERSTAND HOW A PARTICULAR INSTRUMENT WILL RESPOND. PLEASE DO NOT CALL DR. T'S SOFTWARE with questions regarding the response of your instruments to system data.

When sending a system exclusive message which consists of a SERIES of bytes, MAKE SURE NO OTHER SEQUENCE IS SENDING INFORMATION AT THE SAME TIME. If the series gets interrupted by other MIDI data, undesirable results will occur.

DE EVENTS

DE events are used at the end of sequences to instruct the computer to wait a specified number of steps before looping or going on to play the next sequence. DE may also be used to erase or silence a wrong note without affecting the timing of subsequent events.

The sequence in the following example would wait for five measures (480 clock counts) and then end.

MSR-ST	EVNT	TIME	CH	TYP	NOTE	VEL	DUR
1-1	1	480		DE			

SEQUENCE START EVENT

If the value under TYP is a SEQUENCE KEY (1 - 9, A - Z), then the event is a SEQUENCE START EVENT. When this event is reached, the Sequence whose key is specified will be started automatically. The value under NOTE will be a pitch transpose in half-steps. The allowed range is -64 to 63. If a note is transposed out of MIDI KBD range, the end note will be played.

MSR-ST	EVNT	TIME	CH	TYP	NOTE	VEL	DUR
1-1	1	0		A	2	0	1
1-13	2	12		2	-4	0	1
1-25	3	12		F	0	0	1

The value under VEL is a VELOCITY transpose for the Sequence. A negative value of the VELOCITY transpose may prevent some notes in the Sequence from sounding.

MSR-ST	EVNT	TIME	CH	TYP	NOTE	VEL	DUR
1-1	1	0		A	0	4	1
1-13	2	12		2	0	-10	1

The value under DUR is the number of times a SEQUENCE START EVENT will repeat. It overrides the originally programmed repeat value for the Sequence.

MSR-ST	EVNT	TIME	CH	TYP	NOTE	VEL	DUR
1-1	1	0		A	0	0	2
1-13	2	12		2	0	0	8

W in the DUR column represents a WAIT command. This causes the CONTROL SEQUENCE to wait until the SEQUENCE START EVENT has finished before any new events can begin.

MSR-ST	EVNT	TIME	CH	TYP	NOTE	VEL	DUR
1-1	1	0		A	0	0	4
2-1	2	96		E	-2	8	1
5-1	3	288		A	7	12	2
5-1	4	0		B	0	0	2W

CONTROL SEQUENCES

A Sequence which consists of SEQUENCE START EVENTS is called a CONTROL SEQUENCE. When the CONTROL SEQUENCE listed above is started, Sequence A immediately starts and will play 4 times. One measure later, Sequence E starts. The pitch is transposed down 1 full step, and all velocities are increased by 8. Three measures later, Sequence A will play twice, with its pitch transposed up by 7 half-steps, and its velocity up by 12 units. At the same time, Sequence B will start and play twice. The CONTROL SEQUENCE will not continue until Sequence B has completed two plays.

ENTERING VALUES

A valid entry must be typed under each heading (from TIME to DUR) to create a proper entry. After you enter data, press (RETURN) and the program will process the line. If your entry contains wrong or out of range data, the program will respond with an INVALID ENTRY message.

If your line contains an error, you can enter C (RETURN) and then correct it. You can also make your corrections later using EDIT.

USING DEFAULTS

Once you have entered the first line, the program can supply default values for subsequent entries. Your first entry must contain data for TIME, CH, TYP and NOTE. VEL and DUR have initial defaults of 64 and 12.

MSR-ST	EVNT	TIME	CH	TYP	NOTE	VEL	DUR
1-1	1	0	1	ON	C 4	64	12
	2	-					

If you do not wish to change CH, TYP, VEL and DUR for subsequent entries, just enter data for the TIME and NOTE. The NOTE may also default to the last value. You can save typing by using a "/" to separate fields. If you type 0/E4, you will get:

MSR-ST	EVNT	TIME	CH	TYP	NOTE	VEL	DUR
1-1	1	0	1	ON	C 4	64	12
1-25	2	24	1	ON	E 4	64	12
	3	-					

The OCTAVE defaults separately from the NOTE, so you need not specify octave if you stay within the current octave. Typing H/G/80/24 uses the current octave default, but changes the NOTE, VEL, and DUR values.

1-73	3	48	1	ON	G 4	80	24
	4	-					

Use double slashes // to default a field. Typing 0/C5//12 defaults the VEL value but changes the DUR value.

2-1	4	24	1	ON	C 5	80	12
	5	-					

EDITING WHILE IN TYPE FROM COMPUTER MODE

You may go into the EDIT mode by pressing Z (RETURN). Any EDIT function may be performed. To re-enter the TYPE FROM COMPUTER mode, use the EXTEND COMMAND.

PLAYING WHILE IN TYPE FROM COMPUTER MODE

You may PLAY sequences while in the TYPE FROM COMPUTER KBD mode. Press P and (RETURN); the sequence will play what has been recorded so far. To play the current Sequence again, press the Z key. DO NOT ATTEMPT to play the current Sequence using its key, as the end of the sequence has not been set.

Typing P2-14 (RETURN) would PLAY events 2 - 14.

Any previously recorded sequence may be played by pressing F5, then the desired Sequence keys, and then starting the drum machine or pressing the (SPACEBAR) if using the INTERNAL CLOCK.

Press F1 to return to the ENTRY mode (the cursor will start blinking again) to continue entering new notes in the note list.

PLAY while in TYPE FROM COMPUTER will not work if Sequence Z has been recorded. Do not use Sequence Z unless all other Sequences are used.

To EXIT from the COMPUTER KBD ENTRY mode, hit X and (RETURN). The program will return to the MAIN MENU.

3. EDIT SEQUENCE

The EDIT option is used to add, delete, or change events in existing Sequences. You may change the pitch, time, note duration, and velocity of any notes. You can insert or remove any MIDI data such as program or control changes. In many respects, the EDIT function works like a word processor.

Before EDITING a Sequence, it may be wise to COPY or SAVE it, in case you inadvertently alter it too much.

Upon selecting EDIT, the program will ask for a Sequence key. After you specify a Sequence, a new screen will appear:

```
SEQUENCE   1   NAME
LAST PLAY ENDED AT 8
EDIT OPTIONS ARE:

L.   LIST AND EDIT        P.   PLAY SEQUENCE
Q.   QUICK LIST           S.   SWITCH CHANNELS
H.   HARD COPY            E.   EXTEND SEQ
R.   CHANGE REPEATS       I.   INSERT EVENTS
T.   TRANSPOSE/AUTO       C.   COPY EVENTS
N.   NAME SEQUENCE        M.   MOVE EVENTS
D.   DELETE EVENTS        X.   EXIT

          ENTER OPTION:
```

The Sequence key will be displayed, as will the Sequence name if one has been specified. The number displayed after LAST PLAY ENDED AT is the number of the last event sounded when the PLAY function was cancelled. You can use this information to find bad notes in a Sequence.

LIST AND EDIT

LIST AND EDIT will list all or part of a Sequence. The screen can hold 22 event lines. If a sequence contains more events, the screen will scroll up automatically to the last 22 events, unless you stop the LIST. The LIST command can use any of the following formats:

	L	list all events
	L3	list one specific event
	L5-15	list a range of events
	L26-	list starting point to end
	LM1	list events on a particular MIDI channel
Press	F1	to quit LISTING and start EDITING
	ANY KEY	to stop screen display scrolling
	ANY KEY	to continue display scrolling

These formats can also be used with the QUICK LIST, TRANSPOSE, DELETE, PLAY, and HARD COPY commands. THE TWO EXCEPTIONS ARE:

You can't DELETE all events. (Use OPTION 5 on MENU 2 - DELETE SEQUENCE).

You can't TRANSPOSE by MIDI channel.

When the list has been completed or terminated using the F1 key, you may EDIT any line displayed. Use CRSR keys and (SHIFT) CRSR keys to move the cursor to the line and column you wish to change. Make changes using the SPACE and Alphanumeric keys and hit (RETURN) to update the line.

When you have completed your EDITING, you may want to check the last line of the Sequence to be sure it ends on the 1st event of a new measure. Otherwise the Sequence will not stay in sync.

The INST/DEL backs up and erases values while (SHIFT) and INST/DEL creates more space to enter new values.

The TIME abbreviations W, H, Q, and E may be used, but they must be entered in the first column of the TIME field. You must enter data in the format and range that is correct for the type of event that you are editing. Be sure to press (RETURN) while the cursor is on the line being corrected.

An incorrect entry will result in an INVALID ENTRY message and no change will be made. If the new line is OK, the program will erase and retype the line.

NOTE that the MEASURE-STEP and EVENT numbers are for the computer's use only and cannot be EDITED by you. The program WILL NOT RECOMPUTE the measure and step to reflect any changes made to the time values until you re-list the Sequence.

While the Sequence is LISTED, you may execute any valid command from the EDIT OPTIONS page. You must leave a space at the end of the command to prevent the program from misinterpreting your entry. You may also specify a range (L5-13, P2-29, and R4 are all valid commands).

QUICK LIST

QUICK LIST is basically identical to LIST and EDIT. If a Sequence is REALLY long, QUICK LIST will work faster, but it will compute MEASURE-STEP only from the point at which the QUICK LIST begins.

HARD COPY PRINTING A SEQUENCE

The H command causes the program to print the event list to a printer at hardware address 4. If you do not have a printer at address 4, you will get a BASIC error. Type GOTO2 (RETURN) to continue without loss of data.

CHANGING THE NUMBER OF REPEATS

The R option changes the number of repeats for a Sequence ONLY WHEN THE SEQUENCE IS PLAYED FROM THE COMPUTER KBD. On RECORDING a Sequence, a default value of 99 is assigned. To change this value, type R followed by the desired number of repeats. Type R8, for example, to set the number of repeats to 8.

TRANSPOSE/AUTO

The TRANSPOSE option manipulates data in a variety of ways. It is probably the most powerful command of the EDIT options. You may TRANSPOSE the whole Sequence by typing T, or transpose part by specifying a range, e.g. T3-14.

Selecting the T option displays a new MENU.

```
TRANSPOSE OPTIONS
1.   TRANSPOSE PITCH
2.   TRANSPOSE VELOCITY
3.   TRANSPOSE DURATION
4.   AUTO-CORRECT
5.   COMPRESS/EXPAND
6.   TIME REVERSE
7.   AUTO CHANNEL ASSIGN
ENTER OPTION:
```

If you select option 1 - 3, the program responds with ENTER TRANSPOSE AMOUNT OR I: Enter a number (-64 to 63) to perform a TRANSPOSE, or an I for an INVERSION. A pitch transpose of -12 drops all notes down one octave, a velocity transpose of 24 increases all MIDI velocities by 24, and a duration transpose of -3 shortens all notes by 3 time steps.

The program will assign the largest or smallest possible value to a pitch, velocity, or duration transposed out of range.

An INVERSION causes high values to become low and low values to become high. An INVERSION followed by a TRANSPOSE will produce the equivalent of an inversion around any desired value.

INVERSION OF	CENTER PT	EFFECT
PITCH	C4	high/low notes
VELOCITY	60	loud/soft vol or open/closed filter
DURATION	60	short/long notes

It is possible to transpose PITCH, VELOCITY and DURATION out of useful range. Most synthesizers will not respond to the entire MIDI keyboard, and will transpose extreme values into their own range. On some synths, you can transpose the pitch up so high, that the Sequence will consist of only one note. Small velocities and/or short durations may result in notes that are not audible.

AUTO-CORRECT

When you select the AUTO-CORRECT option, the program asks for two values, EVENT STEP COUNT, and DURATION COUNT, IF DESIRED. The EVENT STEP COUNT is the quantization value for note separations (the value under the TIME column). All values under the TIME column will be rounded off to the nearest multiple of the EVENT STEP COUNT entered. If you enter a EVENT STEP COUNT of 12, all events will be quantized to the nearest 8th note.

The DURATION COUNT is a similar quantization value for note durations. Enter a (RETURN) for duration if you do not want to change the duration times (DUR values).

Remember when AUTO CORRECTING that you will normally want to have the DURATION time shorter than the EVENT STEP time, otherwise the notes will 'run' into each other with possibly undesirable results. If you are a stickler for perfection you may AUTO CORRECT both STEP and DURATION with the same value and then use a minus DURATION transpose (-2 or -3) to make the note duration time shorter.

After you've entered the EVENT STEP and DURATION COUNT values, the computer will ask ARE YOU SURE? Verify with a Y or hit any other key to return to the edit menu. With a 96 steps/measure clock, use the following table:

3 for 32nd notes
4 for 16th note triplets
6 for 16th notes
8 for 8th note triplets
12 for 8th notes
16 for quarter note triplets
24 for quarter notes
48 for half notes
96 for whole notes

COMPRESS/EXPAND

The COMPRESS/EXPAND option allows you to switch drum machines (the three clock standards are 96, 48, 24), and with minor editing, have your Sequences sync. This option can also be used to speed up or slow down a Sequence, relative to the other Sequences in your song.

When the COMPRESS/EXPAND option is selected, the program will respond with ENTER FACTOR: Each time value in the Sequence will be multiplied by the entered factor.

To COMPRESS/EXPAND note DURATIONS, follow your entry with a D.

A FACTOR OF	results in
2D	EVENT & DURATION being twice as long
4	EVENT 4X longer, DURATION remains the same.
.5D	EVENT & DURATION being half as long.

TIME REVERSE

The TIME REVERSE option will re-arrange events so that they play in reverse order. You will probably want to move the ending DE event which has now become the first event, back to the end of the Sequence.

AUTO CHANNEL ASSIGN

AUTO CHANNEL ASSIGN will re-assign each consequtive event to a different MIDI channel. When selected you will be prompted with ENTER STARTING CHANNEL, then ENDING CHANNEL. The ENDING CHANNEL must be the same or a higher value. The program will then assign each consequtive note to the next higher MIDI channel staying within the specified range.

You can re-assign all notes back to one MIDI channel by entered the same value twice. This executes more rapidly than the S (Switch MIDI Channel) command.

NAME SEQUENCE

To use the NAME SEQUENCE option, type N (with no space), a name up to eight characters long, and (RETURN). Typing NSTRINGZ(RETURN) would name the sequence STRINGZ.

DELETE EVENTS

DELETE EVENTS will delete all events in the specified range. The computer will ask ARE YOU SURE? before executing the DELETE command.

The DELETE EVENTS option can be entered in any of these formats.

D2	delete one specific event
D5-15	delete a range of events
D26-	delete starting point to end
DM1	delete events on one MIDI channel

PLAY SEQUENCE

The PLAY option allows you to play the current Sequence from the EDIT mode. Hit P then (RETURN). The current Sequence will play once.

You can also play only part of the Sequence. Type P20-25, to play EVENTS 20-25 or P15- to play the sequence from EVENT 15 to the end.

You can replay the Sequence by pressing the Z key. You can also play any other Sequences just as you would using the PLAY option.

PLAY from EDIT will not work if Sequence Z has been recorded on.

SWITCH CHANNELS

The SWITCH CHANNELS option re-assigns events on one MIDI channel to another MIDI channel. Type S3-16 to switch all events on channel 3 to channel 16. Only events on the specified MIDI channel will be switched.

EXTEND SEQUENCE

EXTEND SEQUENCE displays the last 10 events of the Sequence. You may then enter events exactly as described in the TYPE FROM THE COMPUTER KBD mode.

INSERT EVENTS

INSERT EVENTS is similar to EXTEND except that you may start INSERTING at any event in the Sequence. Type I to INSERT before event 1. Type I followed by an event number to INSERT AFTER the event specified.

Press X to return to the edit menu or Z to go into LIST AND EDIT mode.

COPY EVENTS

The COPY EVENTS option copies part of a Sequence to another point in the Sequence. Type C followed by the desired range (C5-15). The computer will prompt with INSERT AFTER: The COPY will be inserted immediately after the event number you enter.

The computer may issue a NO MORE ROOM message if there is not enough memory left to store the expanded sequence. See DISK LOAD and SAVE if you need to re-arrange the Sequence memory.

MOVE EVENTS

The MOVE EVENTS option moves part of a sequence to another location in the sequence. The MOVE option is similar to the COPY option, except that the moved portion of the sequence is deleted from its original position, while in COPY, it is found in both the original and new location. Note that the M operation may also result in a NO MORE ROOM message.

Enter a MOVE command by typing M and the desired range (M3-15). The computer will prompt INSERT AFTER, just as it does when you use the COPY command.

EXIT

To EXIT from the EDIT menu, type X (RETURN). If you are in LIST AND EDIT, type X (RETURN) twice.

4. COPY/APPEND SEQUENCES

The COPY/APPEND command makes a copy of an existing sequence or appends one sequence to the end of a 2nd sequence.

After you select the COPY/APPEND option, the program will prompt with ENTER SOURCE: then ENTER TARGET: Respond to the ENTER SOURCE: prompt with the key of the Sequence that you wish to COPY or APPEND. If you wish to make a COPY of the Sequence, respond to the ENTER TARGET prompt with an unused Sequence key. If you wish to append the sequence respond with a key containing data.

The SOURCE Sequence will not be changed by this operation. The TARGET Sequence will consist of its original data, followed by a copy of the SOURCE Sequence. You can double the length of a Sequence by appending it to itself.

5. MERGE SEQUENCES

The MERGE SEQUENCE option will combine two Sequences into a single sequence. The program will ask for a SOURCE and TARGET, and then insert the source sequence INTO the target sequence. The results will sound as if the two original sequences were started at the same time. The source sequence will not be changed. See PUNCH IN - PUNCH OUT in Chapter 6 - 67 for an example of the MERGE option.

6. OVERDUB

The OVERDUB option allows you to record a sequence in sync with a previously recorded sequence, similar to overdubbing on a multi-track tape deck. OVERDUB will automatically set the new sequence length to equal the original sequence length. The Sequences may later be MERGED, or started together from a CONTROL SEQUENCE.

The program will issue the prompt ENTER SEQUENCE TO OVERDUB: Respond with the key of the sequence that you wish to record in sync with. The program will next prompt ENTER SEQUENCE TO STORE OVERDUB: Respond with the key of an empty Sequence.

The REAL-TIME RECORD OPTIONS screen and the PLAY screen will appear, as described under CREATE NEW SEQUENCE. You may turn on any additional sequence keys you wish to hear by pressing the appropriate Sequence keys. The Sequence that you are OVERDUBBING to will start as soon as you play the KBD or press the F7 key. If you are using a drumbox to provide EXTERNAL CLOCK, be sure to start it as well.

To begin the OVERDUBBED Sequence with silence, press F7. If you do not play any notes on the KBD, the sequence you are syncing to, will continue to repeat. When the end of the Sequence you are syncing to is reached, and you have played the KBD, the original and the new sequence will play back.

The FUNCTION keys operate as described in CREATE NEW SEQUENCE.

7. OTHER OPTIONS

Selecting OTHER OPTIONS displays Menu 2. The options in MENU 2 are described in CHAPTER 5.

MENU 2

MENU 2 contains nine options. After completion of any MENU 2 option, the MAIN MENU will be displayed. You can also return to the MAIN MENU by pressing any other key on the computer KBD. MENU 2 options are:

1. DISPLAY SEQUENCE MAP
2. CHANGE STEPS/MEASURE
3. DEFINE NEW KEY ASSIGNMENT
4. CHANGE CLOCK
5. DELETE SEQUENCE
6. LOAD DATA FROM DISK
7. SAVE DATA TO DISK
8. INITIALIZE DISK
9. RETURN TO INITIALIZATION

1. DISPLAY SEQUENCE MAP

The DISPLAY SEQUENCE MAP option shows how the Sequencer memory is currently being used. This may be useful when you are running short of memory and want to 'squeeze' more sequences in. When this option is selected, the program displays a list the similar to the following:

SEQUENCE DEFINITIONS

KEY	START	END	TIMES	NAME
1	1	98	99	BELLS
2	99	232	99	STRINGS
3	233	299	8	HEAVEN
4	300	430	99	V8RIFF
5	431	448	99	PERC
7	449	501	16	WOODRUM
C	502	679	99	ORCHS.2
E	703	804	99	WOODRUM2
S	1067	1098	1	SONG
W	1161	1227	99	COPYOF3
X	1228	1235	1	PRESETS
Y	1236	1252	1	SONGPRGS

2645 EVENTS REMAINING
2298 LONGEST CHAIN

One entry appears for each Sequence currently in memory. KEY represents the computer key that will play that sequence. START and END show where the sequence resides in memory. TIMES is the number of repeats a Sequence will play, when activated from the computer KBD. If a NAME was assigned during EDIT it will be listed under the NAME column.

The number of events remaining and the length of the longest chain of available events are also displayed. The events of a Sequence must be stored in consecutive memory. Many EDIT operations change the size of a Sequence and often require relocation to a larger block of memory. This can cause the available memory to be broken up into scattered blocks.

Any new Sequence that you wish to create must fit in the largest of these blocks. Some operations require a workspace, and will issue a NO MORE ROOM message, if no block of available memory is large enough.

As more Sequences are recorded and edited, you may start getting NO MORE ROOM messages. Saving all Sequences to Disk and then Loading all Sequences from Disk will 'pack' the memory, thus giving you a chunk of free space to work with.

KEY ASSIGNMENT

From the DISPLAY SCREEN MEMORY option, hitting any key will cause the program to display alternate KEY ASSIGNMENTS. The creation of alternate key assignments is described on page 61.

KEY	SQ	REP	STAR	STOP	TRANS	VTRAN	DTRAN
A	1	8	0	0	2	24	0
B	2	99	10	50	0	0	-3
Z	4	1	1	28	0	0	0

In the above example, three alternate KEY ASSIGNMENTS have been made. Key A will play sequence 1. Since no start and stop events were specified, the whole sequence will be played. If Key A is played from the computer KBD, Sequence 1 will play only one time and be transposed up a full step in pitch and 24 units in velocity. If Key A is played from another sequence, the transpose and repeats of the calling sequence will affect Sequence 1.

Key B will repeat Sequence 2 indefinitely, playing only events 10 to 50. There will be no pitch or velocity transpose, but the duration of each note will be reduced by 3 time steps.

Key Z represents the last Sequence that was played from the EDIT mode. Key Z is assigned by the computer and will point to different Sequences during your session with Dr. T.

You may not EDIT an ALTERNATE KEY ASSIGNMENT. If you wish to change an ALTERNATE KEY ASSIGNMENT you must re-define it.

Press any key to return to the MAIN MENU.

2. CHANGE STEPS/MEASURE

The CHANGE STEPS/MEASURE option allows The KEYBOARD CONTROLLED SEQUENCER to match the clock speed of various drum machines. This affects the MST-ST listing, the note abbreviations used in TYPING FROM THE COMPUTER KBD, and the ALIGN feature. The default value is 96 and the range is 1 - 255.

Changing STEPS/MEASURE does not directly affect the speed at which existing sequences are played back. It WILL affect the CLOCK SPEED if it is reset using the CHANGE CLOCK option described below.

Changing the STEPS/MEASURE is useful for work in time signatures other than 4/4. Setting STEPS/MEASURE to 120 will give a correct measure readout and record alignment for a piece in 5/4 time.

3. DEFINE NEW KEY ASSIGNMENT

The DEFINE NEW KEY ASSIGNMENT feature assigns additional Sequence keys to play part or all of the data stored in an existing sequence, with transposes if desired. This allows you to have multiple copies of the same sequence playing at once (for delay or round effects), or variations of the same sequence assigned to different Sequence keys.

Each KEY ASSIGNMENT may be given a transpose in pitch, velocity, and duration, if desired. The key can be assigned to play part or all of the Sequence. The entered transpose values (except for duration) will be used only when the key is played from the computer keyboard.

Computer will PROMPT	USER enters
ENTER COMPUTER KEY:	any EMPTY Sequence Key
ENTER SEQUENCE KEY:	Sequence you wish to COPY
REPEATS:	(RETURN) or any number 1 - 99
STARTING EVENT:	(RETURN) or any number > or = 1
ENDING EVENT:	(RETURN) or any number < or = end
KEY TRANSPOSE:	-64 to 63
VELOCITY TRANSPOSE:	-64 to 63
DURATION TRANSPOSE:	-64 to 63

The REPEATS will default to 1, the transposes to 0, and the STARTING AND ENDING EVENTS to the first and last events of the sequence played. If you specify a starting and/or ending event, the alternate key will only play the events in the range specified.

An alternate KEY ASSIGNMENT will not list if you try to EDIT it, but it will be displayed on the PLAY screen and the KEY ASSIGNMENT screen (See DISPLAY SEQUENCE MAP). If an ALT KEY is transposed and it calls another Sequence, the transpose will be passed on.

4. CHANGE CLOCK

The CHANGE CLOCK function lets you select either the EXTERNAL or INTERNAL clock. When selected, the program prompts USE INTERNAL CLOCK? If you answer Y, it will prompt ENTER BEATS/MINUTE: Enter the desired clock rate, in BEATS/MINUTE. The program will compute the rate at which it will generate INTERNAL CLOCKS based on the value entered, the number of STEPS/ MEASURE currently in use, and the assumption that the piece is in 4/4 time.

If the computed clock rate is not between one clock every 2.5 milliseconds, and 1 clock every 64 milliseconds, an INVALID ENTRY message will be issued.

During PLAY, the clock speed can be increased by striking the , key and decreased with the . key.

Any response other than Y to the USE INTERNAL CLOCK? sets the program to accept the EXTERNAL clock. Options for the EXTERNAL CLOCK are described in Chapter 3 - 26.

When the internal clock is selected a pitchbend on MIDI channel 16 will change the clock speed. The clock speed will equal .25 milliseconds times the pitch bend amount. The range is 20 - 255. Values of less than 20 may or may not work, depending on your drum machine and the rate at which you send sequence events. The program will 'remember' the last clock time set when it leaves PLAY mode, and use that value again when it re-enters PLAY mode.

Use the following formula to compute BEATS/MINUTE:

BEATS/MINUTE = 240/(CLOCK TIME)(STEPS/MEASURE)

5. DELETE SEQUENCE

DELETE SEQUENCE erases the selected sequence. The program will ask ARE YOU SURE? Press Y to confirm or any other key to escape back to the MAIN MENU.

6. LOAD DATA FROM DISK

The LOAD DATA FROM DISK option allows you to retrieve Sequences that you have previously stored on disk. The program will issue the prompt LOAD ALL SEQUENCES? Press Y if you wish to LOAD a complete set of Sequences, replacing any data currently in memory. Press any other key to load individual Sequences.

If you choose to load all Sequences, the program will ask you to enter the file name. This will default to the name of the last file loaded or saved. You may type over this default value to specify a new file.

If you forget the spelling or name of a Sequence, you may list a DISK DIRECTORY. Save any Sequences are currently in memory and return to INITIALIZATION.

When you LOAD ALL SEQUENCES, the Sequences are loaded into the bottom of memory, leaving a single chain of free space at the top. If you are getting NO MORE ROOM messages, you may be able to continue working by SAVING and then LOADING all SEQUENCES.

LOADING A SINGLE SEQUENCE

When you LOAD A SINGLE SEQUENCE, the program prompts ENTER FILE NAME: Specify the exact name that was used when you SAVED the SINGLE SEQUENCE. This does not have to the be name that was given during EDIT. The program next prompts ENTER SEQUENCE KEY. This must be an unused Sequence key; it does not have to be the same key that was used when you saved it.

If you attempt to assign a Sequence to a key that is already being used the computer will respond INVALID ENTRY. YOU CAN ONLY LOAD A SINGLE SEQUENCE INTO AN EMPTY KEY. You cannot load a SINGLE SEQUENCE unless you have previously saved it as a SINGLE SEQUENCE.

7. SAVE DATA TO DISK

You should save data whenever you make substantial changes. It is also wise to store your sequences on a separate disk. When you select this option the program will ask if you wish to SAVE ALL SEQUENCES? Press Y to save all sequences in a single file, and any other key to save individual Sequences.

The prompt ENTER FILE NAME: will be displayed along with the name of the last used file. You can change this name by typing over it. If you choose to save data to an existing file, the program will allow you to change your mind by asking FILE EXISTS, REPLACE?

A file name can be any combination of ten characters. The program will truncate the file name to ten characters if you should assign more. When you SAVE ALL SEQUENCES, you also save Sequence names and alternate key assignments.

SAVING AN INDIVIDUAL SEQUENCE

When you save an INDIVIDUAL SEQUENCE, the program prompts ENTER FILE NAME: Enter any name you choose, followed by (RETURN). The program will then prompt ENTER SEQUENCE KEY: Reply by pressing the key of the Sequence that you wish to save, and (RETURN).

Make a list of Sequences you save and store it on or with the disk jacket for future reference. Should you lose track of a disk's contents, you may list a DISK DIRECTORY from the INITIALIZATION section of the program.

When the computer saves Sequences, it will automatically assign the prefix SQ. to a single Sequence, and SQALL. to a group of Sequences. It is perfectly OK to SAVE ALL SEQUENCES and then go back and SAVE SINGLE SEQUENCES from the same file. You might want to do this do use the same set of PRESETS again in a different piece.

8. INITIALIZE DISK

INITIALIZE DISK should be used when you need to format a disk to store files on. The program prompts ALL DATA ON DISK WILL BE ERASED. ARE YOU SURE? Answering with a Y will format the disk, any other key will return to the MAIN MENU. Make sure you use a blank disk, or a disk containing data no longer needed.

9. RETURN TO INITIALIZATION

RETURN TO INITIALIZATION lets you reset default values, clock functions, step-time entry options, real-time transpose functions, and read disk directories. The program will prompt you to insert the program disk before proceeding. You may return to the INITIALIZATION section without disturbing Sequence memory.

ADVANCED USER

The KEYBOARD CONTROLLED SEQUENCER is a complex program. Its design is in some ways similar to that of a modular synth and there are many ways in which the program can be used. As you become more familiar with the program, try some of these ideas out.

CONTROL SEQUENCES

One Sequence can start another Sequence. Do this by entering a Sequence key (SEQUENCE START EVENT) under the TYP column. You do not need to specify a MIDI channel. This Sequence may be transposed in pitch from -64 to 63 half-steps by entering a value under the NOTE column. If the original Sequence was also transposed, the two transpose values will be added together.

The value under VEL represents the number of velocity units that the Sequence is to be transposed. This allows you to vary the dynamics of a Sequence by starting it from another Sequence.

MSR-ST	EVNT	TIME	CH	TYP	NOTE	VEL	DUR
1-1	1	0		A	2	8	1
2-1	2	96		1	-24	-10	1
	3	-					

In this example Sequence key A's pitch is transposed two half-steps up and it's velocity is eight units faster than originally defined. Ninety-six clock counts later (1 measure) Sequence key 1 is called. It is transposed one octave lower and its velocity has been decreased by 10 units.

The value under DUR is the number of times a Sequence will be played. This is the number or times the Sequence will repeat and it overrides the original repeat value that was set up. When a W is beside the DUR value, this tells the program to WAIT for the current Sequence to finish playing before continuing with any new events in the list. The DUR number may be from 1 - 99, with 99 indicating to keep playing the current Sequence indefinitely until the PLAY mode is ended.

Pressing the FOOTSWITCH or F7 during PLAY will cancel repeats for any numbered Sequences (1 - 9) that are currently playing. Pressing the Sequence key of any Sequence currently playing will cancel its repeats.

WAIT

The WAIT command forces the computer to finish playing the currently called Sequence before continuing to play any new Sequences. The letter W will be displayed in the W column of the PLAY screen when a WAIT command has been encountered.

Notice that the program does not take WAIT commands into account when computing the MEASURE and STEP values.

MSR-ST	EVNT	TIME	CH	TYP	NOTE	VEL	DUR
1-1	1	0		1	0	0	4
1-1	2	0		2	0	0	4
1-1	3	0		3	0	0	4W
1-1	4	0		A	0	0	2

The WAIT command is also used to create groupings of Sequences which will play simultaneously. In this example the program begins playing the first three Sequences (1 - 3) immediately. When the W at the end of line 3 is encountered, the program will WAIT until the four repetitions have finished before going on to play the next event, Sequence A.

If you are grouping Sequences together and using a WAIT command, it is your responsibility to determine that the Sequences are the correct length. If Sequence 1 were two measures long and Sequence 3 one measure long, then Sequence 1 would continue to play for four more measures while Sequence A began playing.

You may discover some interesting permutations by REPEATING Sequences of different lengths.

VAMPING

MSR-ST	EVNT	TIME	CH	TYP	NOTE	VEL	DUR
1-1	1	0		I	0	0	1
1-1	2	0		6	0	0	99W
1-1	3	0		E	0	0	1

This example creates the situation where one can 'vamp' or jam with the Sequencer. The piece consists of an Intro section, Sequence I, a Vamp section, Sequence 6, and an Ending section, Sequence E. After the Intro, Sequence 6 will loop until you press the FOOTSWITCH or F7. When this occurs, Sequence 6 will complete its current cycle, and the Ending section will play.

Further complexity can be added to the piece by having any of the three Sequences, I, 6, and E also be CONTROL SEQUENCES.

SONG MODE (NESTING CONTROL SEQUENCES)

You can easily build SONGS or CHAIN Sequences together. In the example below Sequence S chains Sequences A, B, C, 7, and 8, while Sequences A, B, and C play Sequences 1 - 6 in different combinations. Some Program disks may have this SONGMODE file, and the file SHELL on them.

KEY	NAME	CONTAINS
1	BVERSE	Bass part for verse
2	PVERSE	Piano part for verse
3	STVERSE	Strings for verse
4	ALTSTRNG	Alternate strings for verse
5	CHORBASS	Bass for chorus
6	CHORPIAN	Piano for chorus
7	BRIDGE	Barking dog bridge
8	END	Big ending
A	CALLVERS	plays Sequences 1, 2, 3
B	ALTVERSE	plays Sequences 1, 2, 4
C	CALCHORS	plays Sequences 5, 6
S	PLAYSONG	plays Sequences A, B, C, 7, 8 using REPEAT and WAIT

The event list for Sequence S would look something like:

MSR-ST	EVNT	TIME	CH	TYP	NOTE	VEL	DUR
1-1	1	0		A	0	0	2 W
1-1	2	0		C	0	0	1 W
1-1	3	0		B	0	0	2 W
1-1	4	0		C	0	0	1 W
1-1	5	0		7	0	0	1 W
1-1	6	0		A	0	0	2 W
1-1	7	0		C	0	0	1 W
1-1	8	0		B	0	0	1 W
1-1	9	0		DE			

A structure like this let's you go back and re-record Sequence 1 without rewriting the song. Or you could EDIT Sequence C to call another Sequence in addition to what it is presently doing. Another application of this feature would involve programming a series of control events, such as pitchbends and storing them in another Sequence. This Control Sequence could then be started by any of the Calling Sequences such as A B or C.

PUNCH-IN AND PUNCH-OUT

There is no specific PUNCH-IN PUNCH-OUT option in the KEYBOARD CONTROLLED SEQUENCER. You can achieve the equivalent by using the EDIT, OVERDUB, and MERGE SEQUENCES commands.

1. Use EDIT to replace wrong notes with DE events. Or to save memory, delete the whole event line and add the time events to the next correct note. Next record an OVERDUB sequence and then MERGE the two sequences together. Consider this sequence.

MSR-ST	EVNT	TIME	CH	TYP	NOTE	VEL	DUR
1-1	1	0	4	ON	G 4	52	15
1-17	2	16	4	ON	E 5	60	7
1-26	3	9	4	ON	C 5	60	7
1-42	4	16	4	ON	D 5	60	4
1-42	5	0	4	ON	A# 4	64	29
1-42	6	0	4	ON	A 4	60	29
1-88	7	46	4	ON	D 5	64	8
2-1	8	9	4	ON	C 5	60	6
2-9	9	8	4	ON	B 4	56	6
2-17	10	8	4	ON	G 4	73	7
2-72	11	55		DE			

Suppose that notes 4 - 6 are incorrect, and that we want to replace them with a phrase recorded in real-time. We can erase these notes by changing their TYP values to DE. The Sequence display would then look like:

MSR-ST	EVNT	TIME	CH	TYP	NOTE	VEL	DUR
1-1	1	0	4	ON	G 4	52	15
1-17	2	16	4	ON	E 5	60	7
1-26	3	9	4	ON	C 5	60	7
1-42	4	16		DE			
1-42	5	0		DE			
1-42	6	0		DE			
1-88	7	46	4	ON	D 5	64	8
2-1	8	9	4	ON	C 5	60	6
2-9	9	8	4	ON	B 4	56	6
2-17	10	8	4	ON	G 4	73	7
2-72	11	55		DE			

When you play the sequence now there will be a hole in it. Next record an OVERDUB. The OVERDUBBED sequence may look something like:

MSR-ST	EVNT	TIME	CH	TYP	NOTE	VEL	DUR
1-38	1	37	4	ON	D 5	52	33
1-40	2	2	4	ON	E 5	44	31
1-43	3	3	4	ON	F# 5	48	29
1-45	4	2	4	ON	A 5	32	27
2-72	5	123	4	ON	DE		

Notice that the OVERDUBBED Sequence will fit in the hole left by the DE events we made in the original Sequence.

Now let's MERGE the two sequences together. The MERGED Sequence should look like:

MSR-ST	EVNT	TIME	CH	TYP	NOTE	VEL	DUR
1-1	1	0	4	ON	G 4	52	15
1-17	2	16	4	ON	E 5	60	7
1-26	3	9	4	ON	C 5	60	7
1-38	4	12	4	ON	D 5	52	33
1-40	5	2	4	ON	E 5	44	31
1-42	6	16		DE			
1-42	7	0		DE			
1-42	8	0		DE			
1-43	9	3	4	ON	F# 5	48	29
1-45	10	2	4	ON	A 5	32	27
1-88	11	46	4	ON	D 5	64	8
2-1	12	9	4	ON	C 5	60	6
2-9	13	8	4	ON	B 4	56	6
2-17	14	8	4	ON	G 4	73	7
2-72	15	55		DE			
2-72	16	0		DE			

Notice that all events of both Sequences have been blended together and that the MRS-ST and TIME lines reflect the new values. The advantage of this method is you do not risk erasing correct notes by punching in too soon or out too late.

DOUBLING SEQUENCE PARTS

You can create thicker parts by copying a Sequence to another key, transposing and deleting certain notes, and assigning the Sequence to a different instrument. The ALT KEY ASSIGNMENT may also be used for this purpose.

SEQUENCER JAMS

If you have already recorded several different Sequences, you can use the COMPUTER option of REAL-TIME RECORD to create a CONTROL SEQUENCE by recording Sequence start events in real-time. You can record multiple takes to get added perspective on the length and structure of your piece. You can AUTO-CORRECT the times of the Sequence start events just as you would AUTO-CORRECT note times.

CREATING AN ECHO EFFECT

You can create an echo effect by using ALTERNATE KEY ASSIGNMENTS. Define an ALTERNATE KEY ASSIGNMENT for each echo that you want and then put them into a CONTROL SEQUENCE. In the following CONTROL SEQUENCE, Sequence 1 consists of a melody line and Sequences M, N, and O are ALTERNATE KEY ASSIGNMENTS.

MSR-ST	EVNT	TIME	CH	TYP	NOTE	VEL	DUR
1-1	1	0		1	0	0	1
1-3	2	2		M	0	-17	1
1-7	3	4		N	0	-13	1
1-11	4	4		O	12	-30	1
2-1	5	86		DE			

You can vary the time of the echoes in relation to the original sequence, and control their pitch and volume also.

USING SHELL STRUCTURES

You can simplify the creation of new Songs by creating one or more SHELL STRUCTURES containing groupings of CONTROL SEQUENCES. You can use one of these SHELL STRUCTURES as a starting point to create a new song. If you consistently use the same Sequence keys for the same functions from song to song, it makes using the Sequencer program easier. For instance, assigning Sequence X as a preset key or Sequence S as a Song key. etc.

The file SHELL may be found on some Program disks. Consider the following example:

S	RE	NAME	P	F	W	S	RE	NAME	P	F	W
1	2	V1BASS				2	2	V1CHORDS			
3	2	V1FLUTE				4	2	V1STRING			
7	1	CHORBASS				8	1	CHORCHRDS			
9	1	CHORFLUT				A	1	CHORSTRNG			
D	1	BRBASS				E	1	BRCHORDS			
F	1	BRHORN				G	1	BRSTRING			
J	1	ENDBASS				K	1	ENDCHORD			
L	1	ENDFLTE				M	1	ENDSTRNG			
P	1	CALLV1				Q	1	CALLBRDG			
R	1	CALLCHOR									
T	1	CALLEND									
						W	1	CALLSONG			
X	1	PRESETS				Y	1	COPYBUFF			

READY USING DRUMBOX F1 TO EXIT

Here Sequence keys are recorded in groups of four. Sequence 1, D, and J being bass parts. If we were to list Sequence P (CALLV1) we would find that it calls up Sequence keys 1 - 4.

MSR-ST	EVNT	TIME	CH	TYP	NOTE	VEL	DUR
1-1	1	0		1	0	0	1
1-1	2	0		2	0	0	1
1-1	3	0		3	0	0	1
1-1	4	0		4	0	0	1
2-1	5	96		DE			

Sequences Q, R, and T each in turn call up the Bridge sequences (D - G), Chord sequences (7 - A), and End sequences (J - M).

Sequence W (CALLSONG) calls up the different parts to a song. (PRESETS, CALLV1, CALLV1, CALLCHOR, CALLV1, CALLBRDG, CALLBRDG, CALLEND.)

MSR-ST	EVNT	TIME	CH	TYP	NOTE	VEL	DUR
1-1	1	0		X	0	0	1
2-1	2	96		P	0	0	2W
2-1	3	0		R	0	0	1W
2-1	4	0		P	0	0	1W
2-1	5	0		Q	0	0	2W
2-1	6	0		T	0	0	1W
3-1	7	96		DE			

COPYBUFFER

Sequence key Y has been assigned as a COPYBUFFER as a precaution when trying another take or experimenting with auto-correcting or editing. Whenever you wish to EDIT something and you are not sure of the results, delete the old contents of Sequence Y and copy the current Sequence you wish to work on to Y.

PRESETS

Storing the Presets as part of the piece, lets you instantly recall the programs that were used should you wish to return to a song a week or month later (assuming you haven't changed the programs in your synth).

On some instruments, calling a preset over MIDI requires up to 1/4 second for settling time. We could use a Sequence key (here Sequence key X) to call up the initial voice presets during a drum count off at the beginning of the song. Listing Sequence X would reveal:

MSR-ST	EVNT	TIME	CH	TYP	NOTE	VEL	DUR
1-1	1	0	3	PG	85		
1-5	2	4	2	PG	13		
1-9	3	4	4	PG	21		
1-13	4	4	5	PG	67		
1-17	5	4	6	PG	75		
1-21	6	4	7	PG	77		
1-25	7	4	8	PG	33		

You may sometimes encounter difficulties in changing PRESETS. You have to insert PG changes while no notes are being sent to that instrument. You can do this by making PG changes a few clock counts before a new sequence is to begin. See the next section CHANGING PROGRAMS AS SONG PLAYS.

PROGRAMMING A SONG WITHOUT USING WAITS

Creating a complex song without WAITs gives you complete control of the starting time of each separate part. You will have to calculate the correct starting times so that the different parts 'sync' properly with each other.

A PLAY SCREEN for such a song may look like:

```
S RE NAME      P F W S RE NAME      P F W
- -- --------- - - - - -- --------- - - -
1 99 BELLS     1 S   2 99 CLAV1     1 S
3 99 HEAVEN    1 S   4 99 V8RIFF    9 S
5 99 PERC      4 S   6 1  2
7 99 WOODRUM

                     C 99 ORCH.2
D 99 BRASS           E 99 WOODRUM2
F 99 PIANO161



                     S 1  SONG      1

V 99 COPY4           W 99 COPYOF3
X 1  PRESETS         Y 1  SONGPRGS 1 S
Z 1  7               MEASURE   32
REAL-TIME SEQUENCES: 12
+ PI  1   - PI  2    £ PI  4   H PI  7
D PI 12   @ VE  6    * VE 12   ↑ VE 24
R DU  1   C DU  3    C DU  6
```

READY 124 BEATS/MINUTE F1 TO EXIT

In this example Sequence S - SONG has been set up to play the 'song'. Listing the first ten lines of Sequence S reveals:

MSR-ST	EVNT	TIME	CH	TYP	NOTE	VEL	DUR
1-1	1	0		1	0	0	1
1-1	2	0		2	0	0	1
1-1	3	0		3	0	0	1
1-1	4	0		4	0	0	99
1-1	5	0		5	0	0	4
1-1	6	0		Y	0	0	1
33-1	7	3072		7	0	0	1
49-1	8	1536		6	0	0	1
49-1	9	0		D	0	0	1
65-1	10	1536		3	0	0	1

Pressing S turns on the first six sequences immediately. Thirty-two measures later Sequence 7 starts playing. Another sixteen measures later Sequences 6 and D begin. Sequence 4, V8RIFF, will loop indefinitely while Sequence 5 plays only four times. Sequences can be any length you like; you may find it easier to keep them in multiples of eight bars.

CHANGING PROGRAMS AS SONG PLAYS

Sequence Y is labelled SONGPRGS. This sequence is similar to the PRESET sequence except that it changes the programs for different instruments as the piece progresses. Listing Sequence Y reveals:

MSR-ST	EVNT	TIME	CH	TYP	NOTE	VEL	DUR
16-95	1	1534	4	PG	21		
32-95	2	1536	4	PG	4		
32-95	3	0	5	PG	35		
48-95	4	1536	4	PG	7		
48-95	5	0	5	PG	68		
64-95	6	1536	4	PG	21		
64-95	7	0		DE			

Notice that the program changes start two clock counts short of a whole measure. This lets the synth change programs before it has to play a note. You may have to vary this depending on the instruments you are using. Of course if a sequence starts with a rest, you might make the program change on the first clock count of a measure.

It makes no difference to the computer if a PG event is played from the SONGPRGS sequence, the SONG sequence, or the note sequence itself.

USING THE SEQUENCER TO STORE DRUM PATTERNS

MIDI drum machines have a lot of potential with the SEQUENCER. You can use VELOCITY and the EDIT and TRANSPOSE functions to manipulate drum patterns far beyond what any drum machine could previously do. In fact, you could store groups of drum patterns with the KEYBOARD CONTROLLED SEQUENCER.

Connect the drum machines MIDI OUT to the SEQUENCER and dump patterns or whole songs into a sequence to save for future reference.

MERGING INSTRUMENT AND SEQUENCER DATA

There are times when it may be desirable to merge MIDI data from an instrument in real-time with the MIDI data produced by the Sequencer. For example, you may wish to control some voices on an Xpander from the Sequencer and others from an external keyboard. The program has no explicit MERGE feature. You can achieve a MERGE by using the echo feature in the record option, while playing back the sequence(s) you wish to modulate. Unfortunately, the original version of the Sequencer will immediately start playing back a sequence being recorded as soon as it runs out of memory.

Versions of the Sequencer with serial numbers 6000 or higher have been changed so that they will keep re-recording the last MIDI event when they run out of memory. You can thus use the record with echo feature to merge incoming data with sequence data for as long as you need to.

GENERAL DRUM MACHINE INFORMATION

Drum machines manufacturers unfortunately have not universally chosen to adopt a set of standards. There are two basic formats with a few variations among the six most popular drum machines. See APPLICATIONS in the APPENDIX for individual specs on each machine. The two formats used in drum machines are:

1. PULSE CLOCK IS ON when machine is running.
   NO CLOCK when machine is OFF.

DRUM MACHINE	STEPS/QUARTER NOTE	BEATS/MEASURE
YAMAHA RX11 & RX15	24	96
DRUMULATOR	24	96
LINN	48	192
OBERHEIM DX & DMX	96	384

With one of these drum machines and Sequential Model 64 or 242, run a guitar cord from the CLOCK OUT of the drum machine to the CLOCK IN of the interface. If you are using a Model 64, be sure the clock select switch is to the left.

2. PULSE CLOCK ALWAYS ON
   RUN/STOP signal IS HIGH when ON and LOW when OFF.

ROLAND DRUM	24	96
KORG DRUM	24	96

These machines use a DIN connector on their sync input and output jacks. When using either of these machines with the SCI-64 box, you must use a stereo plug in the SCI START/STOP jack. Wire the CLOCK signal, pin 3 of the ROLAND or KORG to the TIP of the stereo plug and wire the RUN/STOP signal, pin 1 of the ROLAND or KORG to the RING of the stereo plug (right below the tip). Be sure the clock select switch is to the right.

When the PASSPORT interface is used to drive either the ROLAND or KORG drumbox, pin 3 out will have the CLOCK and pin 1 will have the RUN/STOP. The user can set the RUN/STOP to toggle on and off when the internal clock is started or stopped, or to be on while the clock is running.

MAKING AN ADAPTER CABLE FOR ROLAND/KORG MACHINES

If you are using a ROLAND or KORG drumbox with a Model 242 and you want to start your sequences and the drum box at the same time, you will have to invert an AND GATE in the patch cord. This is easier than it sounds (Even I can do it!).

Connect pin 1 of the DIN to pin 7 of a 741 or equivalent op amp. Connect the ground of the DIN to pin 4 of the 741 and ground of a 1/4 inch plug. Connect pin 3 of the DIN to pin 3 of the 741. Connect pins 2 and 6 of the 741 to each other and the tip of a 1/4 plug, which you then plug in to the CLOCK IN of the Model 242.

MIDI CLOCK DRUM MACHINES

Some drum machines (YAMAHA) can send and receive either a pulse or MIDI clock. This provides you with several options. You could configure your system to run from an internal clock and send out a MIDI clock to drive the drums. This would still require you to create patterns on the drum machine and then write the patterns into a song.

Another alternative is to have the SEQUENCER play the drums by sending the required note values over MIDI. By recording drum parts from a KBD you can do a lot of subtle and/or drastic effects with VELOCITY which will control the amplitude of the drums. Another advantage of this method is that the total score for a song can be stored on disk.

The YAMAHA drum machine allows you to set the key and MIDI channel for each drum to be triggered. Thus you can create drum tracks which will do 'hits' with a bass part for instance. The drums can also be playing their own patterns simultaneously.

GENERAL MIDI INFORMATION

Most MIDI connectors are 5 pin DINs but a 3 pin CANNON connector may also be used (the VOYETRA). There is no physical conductor between the MIDI IN of one machine and the MIDI OUT of another, so you can't blow something by incorrect patching.

Although MIDI cables look identical to sync cables, the grounding of the two cables is different. A sync cable can cause problems.

The signal found at the MIDI THRU jack is a copy of what is present at the MIDI IN jack. When an instrument is acting only as a master, no signal is present at the THRU jack. The signal at the MIDI IN jack will likewise have no effect on the MIDI OUT signal.

Not all instruments have a MIDI THRU. You will need a MIDI junction box if you have more than one instrument with doesn't have a THRU. The junction box can also be used to reduce the MIDI time delays (about 7 milliseconds per instrument) created when MIDI instruments are chained together.

MIDI MODES

The four MIDI modes are:

Omni On Poly
Omni Off Poly
Omni On Mono
Omni Off Mono

When a KBD is put in an Omni On mode it will respond to information sent on all of the 16 MIDI channels. When it is in an Omni Off mode, an instrument will respond only to events on its designated channel.

An instrument in Poly mode can play more than one note on each channel. An instrument in Mono mode can play only one note per channel.

The choice of MODE will affect different instruments in different ways. A Six-Trak or CZ-101 becomes MULTI-TIMBRAL in mono mode. It can play one note on each of six (Six-Trak) or four (CZ-101) consecutive MIDI channels, using a different patch program on each channel. A DX7, cannot be placed in Omni On mode and can never play more than one patch program at a time.

You can insert MODE changes in your Sequences using the procedure described in the section USEFUL MIDI COMMANDS.

With a Six-trak, or Casio CZ-101, you may have the instrument playing an electric piano part (Omni Off Poly), pause and then start playing four monophonic lines (Omni Off Mono) using different instrument voices.

Some synthesizers can be placed in a mode called LOCAL CONTROL OFF. In this mode, they will respond ONLY to signals coming in via MIDI. They will continue to send keyboard information via MIDI OUT.

Local Control On will return the synth to sounding whatever is played on it's KBD.

System Common messages are sent to all instruments regardless of MIDI channel assignment. The TIMING CLOCK will advance drum machines and sequencers to move in time with the KEYBOARD CONTROLLED SEQUENCER.

System Real-time messages can be used to START, CONTINUE, or STOP external sequencers and drumboxes. If the INTERNAL CLOCK is in use, the program will automatically send a MIDI START when the clock is started. It will always send a MIDI STOP when F5 or F1 is pressed in play mode.

System Exclusive information is designed to be understood by synthesizers made by a specific manufacturer. The meaning of System Exclusive information is a function of the instrument used. You can use single byte events to send System Exclusive information, but it is YOUR responsibility to determine the response of your instruments to the information sent.

SOME USEFUL MIDI COMMANDS

Several MIDI commands for initializing your synthesizers can be sent from sequences. NOT ALL COMMANDS WORK WITH ALL INSTRUMENTS. Consult your synthesizer documentation for more information. Please do not call DR. T's for such information.

Initialization commands are all entered into sequences from the computer KBD as control changes, event type CC. Make sure the information is sent on the channel your instrument is receiving on. Enter Control Change under TYP, the type value under NOTE and the value under VEL:

MSR-ST	EVNT	TIME	CH	TYP	NOTE	VEL	DUR
1-1	1	0	4	CC	Type	Value	

```
Type = 122 : Value = 127    Local control on
Type = 122 : Value = 0      Local control off
Type = 123 : Value = 0      All notes off
Type = 124 : Value = 0      Omni off, all notes off
Type = 125 : Value = 0      Omni on, all notes off
Type = 126 : Value = 0      Mono on, omni off
                            all notes off,
                            1 channel per voice
Type = 126 : Value = N      Mono on, all notes off
                            N channels used
                            (not implemented on
                            most machines)
Type = 127 : Value = 0      Poly on, omni off
```

MSR-ST	EVNT	TIME	CH	TYP	NOTE	VEL	DUR
1-1	1	0	5	CC	126	0	
1-1	2	0	5	PG	0		
1-1	3	0	6	PG	32		
1-1	1	0	7	PG	48		
1-1	2	0	8	PG	64		
1-1	3	0		DE			

This sequence was programmed for use with a CZ-101 on MIDI channel 5. It would first put the instrument in MONO ON, OMNI OFF mode, and then assign voices to the instrument on its new receive channels, 5 - 8.

In real-time the following SINGLE BYTE messages may be useful:

248 Timing clock
250 Start
251 Continue
252 Stop

MSR-ST	EVNT	TIME	CH	TYP	NOTE	VEL	DUR
1-1	1	0		*	250		
2-1	2	96		*	252		
4-1	3	192		DE			

The above example would send a START command as soon as the sequence was activated and a STOP command 1 measure later. You can intersperse TIMING CLOCK signals into a Sequence which contains either CONTROL data or NOTE data.

MSR-ST	EVNT	TIME	CH	TYP	NOTE	VEL	DUR
1-1	1	0	4	ON	G 4	64	8
1-1	2	0		*	248		
1-7	3	6	4	ON	F 5	64	8
1-7	4	0		*	248		
1-13	5	6	4	ON	A 4	64	8
1-13	6	0		*	248		
1-19	7	6	4	ON	A# 4	64	8
1-19	8	0		*	248		
1-25	9	6	4	ON	G 4	64	8
1-25	10	0		*	248		
1-31	11	6	4	ON	F 4	64	8
1-31	12	0		*	248		

This sequence would play notes on an instrument assigned to MIDI channel 4. The sequence also sends a MIDI timing clock with every note. This clock could be used to advance an external device.

TROUBLE SHOOTING

The KEYBOARD CONTROLLED SEQUENCER is a complex program that can be used with many different complex pieces of equipment. You will very likely have a problem whose solution is not obvious. This section describes many of the problems that you might encounter while using the program.

There are two general tactics that are useful when trouble-shooting a complex system. You can attempt to isolate the source of the trouble by changing one aspect of the system at a time. You can also simplify the system by using fewer pieces of equipment or program features. You should try both approaches when confronted with a problem in the use of the software.

In general, problems are most likely to be caused by mis-use of the software, incorrect setup of the hardware, or user misunderstanding of the way a specific piece of hardware interacts with the software. Problems can also be caused by malfunctioning hardware (computer, disk drive, interface or synthesizer), program bugs, or a bad program disk. A bad disk will almost always cause errors in program LOADING, rather than program execution.

PROGRAM GIVES ERRORS ON LOADING

There are two possible causes of this. If you use a disk with an interface for which the disk is not valid, or do not follow the loading procedure for the interface used, the program may give errors before the loading process is complete. If you have a bad program disk, you will also experience loading errors. If you suspect that you have a bad program disk, call Dr. T's to arrange for a replacement.

COMMODORE APPEARS DEAD

Adjust monitor settings. Power down and unplug MIDI box, on repower does computer respond OK now? Is DRIVE on and is drive cable OK? Power down and connect MIDI box again. Is MIDI box plugged in completely? SCI boxes are easy to move and break the connection. Does SEQUENTIAL CIRCUITS LOGO come on? SCI boxes sometimes have to 'cool off' for a few minutes before they will power up correctly. Is SHIFT LOCK key off?

DISK DRIVE PROBLEMS - DRIVE APPEARS DEAD OR GIVES ERROR MESSAGES

If the Drive appears dead on loading the program, type OPEN 1,8,15,"I"(RETURN). Wait one minute, and load the program.

If you attempt to load or save a file with the Disk Drive off, you will get the error message DEVICE NOT PRESENT. Type GOTO2(RETURN). You will be returned to the MAIN MENU with your data intact.

If you attempt to do a Disk operation with the door open, or no disk in the drive, you will get a DISK ERROR READ ERROR or DRIVE NOT READY message. Press (RETURN) to get back to MAIN MENU, close the drive door and try again. On some machines, repowering only the DRIVE will work (remove disk first).

If you continue to get ERROR messages after doing the above. Insert the Program disk and return to INITIALIZATION and then to the MAIN program.

If the LED on the drive is continually blinking, this indicates a disk I/O error. Shut off the drive for 10 seconds and then repower. You should make safety copies of any important files (on a different disk).

NO INSTRUMENTS RESPOND

The program may crash. ARE YOU USING THE RIGHT INTERFACE FOR THE PROGRAM VERSION YOU HAVE AND FOLLOWING THE LOADING INSTRUCTIONS FOR THE INTERFACE YOU HAVE? Check the disk version on the label of the program disk.

Are synths wired up correctly? Are they set to the right MIDI channel? Put them into OMNI mode if you can do this locally. Is MIDI box plugged in completely? If you have another Sequencer program, try that, - does it work? Are MIDI cables good?

Is program looking for a non-existent external clock? Reset program for internal clock and try that first. Is recording KBD actually sending anything to computer? Use LIST and EDIT commands to verify. Write a simple sequence from computer KBD and send that to instruments. Disconnect synths and start with one synth connected or try plugging one KBD MIDI OUT to a second instrument MIDI IN to check cables and ascertain that the instruments work by themselves.

SOME INSTRUMENTS RESPOND, BUT NOT ALL

Check wiring. Turn all instruments to an OMNI mode and try connecting one instrument at a time to the Commodore. One instrument could have a bad MIDI THRU. Are instruments ENABLED and set to proper channels. Is the Sequencer sending on the correct channel?

SEQUENCER PLAYS BACK, BUT NOTES ARE GARBLED

Is one instrument 'stuck' with one or more voices on? Reset the instrument by changing programs on the specific instrument, or power-down the instrument. Is your drumbox clock intermittent? Cable good? Try the INTERNAL clock.

Are notes overlapping improperly? If an instrument is in mono, and notes overlap, the instrument may not retrigger the envelopes. If an instrument is in poly mode and notes of the same pitch overlap, undesirable results are likely to occur. If a note ends and a new note begins in the same time step, the new note may start before the old one ends, causing overlap.

Program changes on some instruments, such as a DX7 or a Poly 800, can take up to 1/4 second. If you are using such an instrument, insert your program changes BETWEEN notes, instead of just before or after a note.

SYNTHESIZER 'SPEWS OUT' NOTES

If you loop a sequence that contains one or more MIDI events, with times of zero, the program will spew out these MIDI events as fast as it can, causing your synthesizer to sound as if its 'going haywire'.

If you loop a control sequence of length zero (Sequence calling a Sequence), and the control sequence does not have a WAIT programmed, that sequence will keep restarting all of the sequences it is controlling, and they will keep replaying their first notes.

Avoid looping any sequence whose times are all zero, unless it has a WAIT programmed.

INSTRUMENT SENDS DATA, BUT DOES NOT RECEIVE

The instrument may not be set to receive on the MIDI channel that it is sending on. Are MIDI cables good? Some sync cables look like MIDI cables, but do not work. Is the Sequencer getting any data. If the program is expecting EXTERNAL CLOCK and does not receive it, it will not record. Use LIST and EDIT to check that you are sending valid data on the proper MIDI channel.

BAD DRUMBOX CONNECTION

Happens with SCI-Model 64 boxes. Results in no clock, or intermittent clock pulse getting thru. An intermittent clock results in wrong timing on playback. Check LISTING of sequence, is this what you played? Try using SCI program - is it intermittent here also? Change drum clock cables. Play a sequence and jiggle (very CAREFULLY making sure you move only the clock jack and not the MIDI box to computer connection). Does playing stop?

TIMING WRONG ON RECORDING

Are you using a footswitch? The SCI footswitch is a NORMALLY OPEN footswitch. Using a NORMALLY CLOSED footswitch will cause the program to respond when you LET UP the switch, instead

of when you press down on it. Check for intermittent clock connection. Are you playing back sequences and trying to record fast pitchbends? MIDI data may be coming in faster than the processor is able to handle it.

Are you using INTERNAL CLOCK when you want to use EXTERNAL?

MIDI CONTROL PARAMETERS NOT RECORDED

Were they selected in RECORD options. Does this instrument send & receive all parameters? Use EDIT and LIST commands to verify that control changes were recorded. Do you need to set codes for your synth or send a SYSTEM EXCLUSIVE command? Early DX7s sent after-touch on MIDI channel one parameter 3. See REAL-TIME RECORDING.

SEQUENCE AND DRUMBOX GO OUT OF SYNC WHEN LOOPING

This occurs if the length of the sequence is not a multiple of the length of the drumbox pattern. If you do not use the ALIGN feature while recording, you will almost always end the recording process a little before or after the end of a measure. On Playback each loop will put the sequence further out of sync.

When using ALIGN, you must press the F7 key during the last measure that you wish to record. Pressing F7 a fraction of a beat into the next measure, will force the program to continue recording for another entire measure, even if you do not play any notes.

Alignment problems can be corrected after recording by using the EDIT option. Add or subtract time to the last DE event, making it occur on the first step of a measure. Check your correction by LISTING the sequence again.

Alignment problems can be created by inserting, deleting, or editing the time values of a sequence. Always check the sequence length after EDITING by listening the last event. If the value under ST is 1, the sequence is a whole number of measures long.

PLAY FROM EDIT OR STEP-TIME ENTRY DOES NOT WORK.

These features use Sequence Z. Do not create a Sequence Z unless all other keys have been used.

SYNTHS NOT ACCEPTING PROGRAM CHANGES

Some synthesizers, e.g. Sequential, power up in a mode in which they do not accept program changes via MIDI. Your synthesizer manual should contain instructions on how to make them accept program changes. The program will enable all MIDI sends and receives on a Six-trak, if the Six-trak is on and connected while the program is booted up.

CANNOT SET DESIRED CLOCK SETTING

You can use the change clock option to set the number of STEPS/MEASURE, but only certain values can be used. If you select a value that cannot be used, the program will round off to the nearest possible value. If you need more resolution, you will have to use an external clock.

DRUMBOX MEASURE DOES NOT EQUAL SEQUENCE MEASURE

The length of a measure in the sequencer is initially set to 96 steps. This is equivalent to 24 steps/quarter note, or 24 steps/beat. Use the CHANGE STEPS/MEASURE option found on MENU 2 to change the number of steps/measure in the sequencer to any value from 1 to 255. By setting CHANGE STEPS/MEASURE to 192, for example, you can sync to a 48 steps/quarter note drumbox.

Use the CHANGE CLOCK option on the INITIALIZATION menu to increase the number of external clock steps required for each sequencer step. By setting the EXTERNAL CLOCKS PER STEP to 4, and leaving the STEPS/MEASURE at 96, you can sync to a 96 steps/quarter note drumbox.

The external clock output of the Passport interface will produce only one pulse for every two internal clock steps. If you are driving a drumbox which requires pulses, you can achieve sync by setting the STEPS/MEASURE of the sequencer to double that of the drumbox.

Another method to achieve sync with the Passport interface is to double the number of EXTERNAL CLOCKS PER STEP. Then set the INTERNAL clock rate to twice the value actually desired.

A 'WAIT' THAT WAS PROGRAMMED DOES NOT OCCUR

Sequences which call other sequences and use the WAIT feature should have a DE event with a time of zero for the last event.

MSR-ST	EVNT	TIME	CH	TYP	NOTE	VEL	DUR
1-1	1	0		A	0	0	1W
1-1	2	0		DE			

If you do not do this, you will encounter problems when you try to chain this sequence into a 'higher level' control sequence.

NOTICEABLE TIME DELAYS OCCUR WHEN SEQUENCES START OR LOOP

The computer is a powerful, but finite tool. If you attempt to play several Sequences simultaneously, which in turn each play a lot of notes simultaneously, the computer may 'lag'. If this occurs, rearrange you sequence structure to reduce the amount of work the computer has to do in one time step. Edit the timing so that not as many Sequence start events occur at the same time.

You can not have a instrument change programs and try to sound a note in the same time step. See the note on program changes under SEQUENCER PLAYS BACK, BUT NOTES ARE GARBLED.

SYNTHESIZER NOT FUNCTIONING IN MULTI-TIMBRAL MODE

Some multi-timbral synthesizers (the Six-trak and the CZ-101), power up in poly mode. To use the multi-timbral feature, you must set them to MONO mode, either through MIDI (see the section on useful MIDI commands) or by following the instructions in your owner's manual.

The Six-trak will always transmit on its basic channel, so you may need to use local control off and echo mode to record in real-time. You will have to use the EDIT mode to insert program changes for each channel recorded, as selecting a program on the SIX-TRAK selects it for all six voices.

The CZ-101 is more flexible. You can select programs for all four channels independently from the instrument itself, or thru MIDI, and you can transmit on any of the four channels in use.

SEQUENCE NAME DISAPPEARS ON PLAYBACK

The REAL-TIME TRANSPOSE display and the sequence name display share the same space on the screen. The sequence name will disappear when played, unless you use the REAL- TIME TRANSPOSE FUNCTIONS OPTION on the INITIALIZATION menu to turn off the real-time transpose display. (Sub-option 14).

You may want to reduce screen clutter by using Sub-option 15 to turn off the display of the 11 REAL-TIME TRANSPOSE KEYS. This will clear the bottom few lines of the screen. The transpose keys will still work, however.

SEQUENCE BEING ERASED IS PLAYED ON RE-RECORDING

You do not need to press the Sequence key of a Sequence being recorded or re-recorded. Doing so can cause a variety of problems. In particular, if the Sequence was just erased, it will cause it to replay.

EQUIPMENT HOOKUP

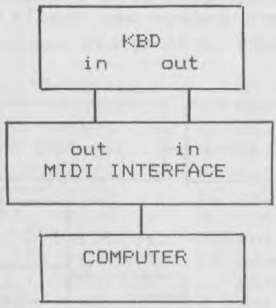
Follow the procedure in your Computer Owners Manual for standard hookup. With the power off, plug your MIDI interface box into the back of the Commodore. Be sure it is fully inserted and its feet are resting securely on a firm surface.

Take the MIDI OUT of the Keyboard from which you wish to record with and plug into the MIDI IN of the Interface box. Connect the Interface box MIDI OUT to your keyboard's MIDI IN. Connect other instruments by using the first Keyboard's MIDI THRU to a second instrument's MIDI IN. MIDI connectors are optically coupled so a wrong connection will at worst result in no data transmission. Be sure that each instrument is assigned to an appropriate MIDI channel and is activated to send and receive MIDI information.

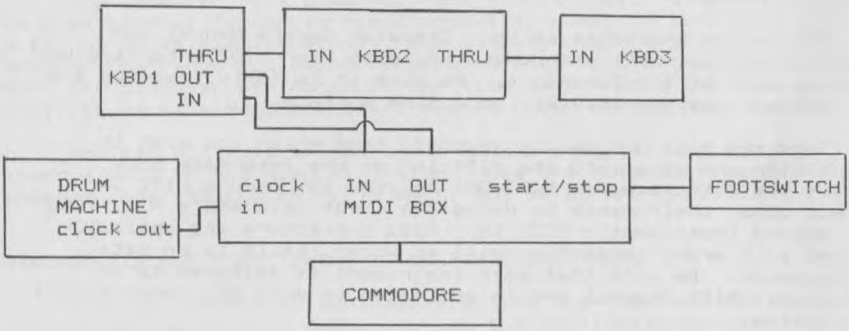
There are several ways various interface boxes, keyboards and drum machines may be connected. If your drum machine is MIDI compatible you may want to put it in the MIDI chain. You may need a sync box if you plan to overdub to tape. Most drum machines won't sync to tape and drive the SEQUENCER simultaneously. It will take some experimentation to find the set-up most suited to your individual needs.

You might find it easier to use the Sequencer clock while composing your piece and then switching your set-up for syncing to tape purposes.

BASIC EQUIPMENT SET-UP



SET-UP FOR THREE KBDS & DRUM MACHINE

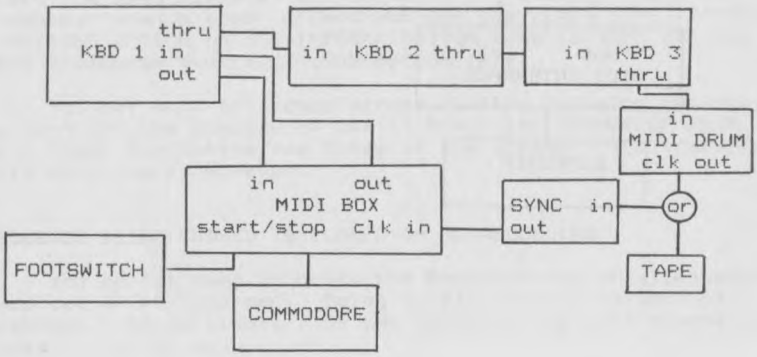


If you plan to use your drum machine to drive the KEYBOARD CONTROLLED SEQUENCER and you are using an SCI box, connect the drum machine's sync out to the SCI's CLOCK IN. If you have a Korg or Roland drum machine see GENERAL DRUM MACHINE INFORMATION in Chapter 7 for more details.

An optional ON/OFF footswitch may be plugged into the START/STOP jack of the SCI MIDI box. This duplicates the function of the F7 key.

NEVER MOVE THE COMPUTER WHILE THE SYSTEM IS POWERED UP! If contact is momentarily broken on certain pins between the Interface box and Computer, severe damage may result!

SET-UP TO SYNC TO TAPE



LIST OF COMMANDS

Some common uses for keys on the Commodore are given below:

KEY(S)	FUNCTION
0	Exits from any function requiring a Sequence key.
1 - 9	Refer to Sequences defined in Program.
A - Z	Refer to Sequences defined in Program.
C	Re-enters line in TYPE FROM COMPUTER.
P	Plays the current Sequence in EDIT or Goes to PLAY mode from MENU 1.
X	Exits from EDIT, LIST AND EDIT, or TYPE FROM COMPUTER.
Z	Replays current Sequence in EDIT or STEP RECORD. Goes directly from TYPE FROM COMPUTER KBD to LIST AND EDIT.
RUN/STOP	EXITS to BASIC.

VALUES FOR AUTO-CORRECT (96 steps/measure)		
3	=	32nd notes
4	=	16th note triplets
6	=	16th notes
8	=	8th note triplets
12	=	8th notes
16	=	quarter note triplets
24	=	quarter notes
48	=	half notes
96	=	whole notes

ABBREVIATIONS in EDIT or TYPE FROM COMPUTER		
A	=	last value used
(SHIFT) E	=	16th note triplets
S	=	16th notes
(SHIFT) Q	=	8th note triplets
E	=	8th notes
(SHIFT) H	=	quarter note triplets
Q	=	quarter notes
H	=	half notes
W	=	whole notes
(SHIFT) W	=	whole note triplets

Default values assigned to REAL-TIME TRANSPOSE keys:

KEY	TRANSPOSES	AMOUNT
+	PITCH	1 half-steps
-	PITCH	2 half-steps
LB	PITCH	4 half-steps
C(CLRHOME)	PITCH	7 half-steps
I(INSTDEL)	PITCH	12 half-steps
@	VELOCITY	6 units
*	VELOCITY	12 units
UPARROW	VELOCITY	24 units
(RETURN)	DURATION	1 unit
CRSR U/D	DURATION	3 units
CRSR L/R	DURATION	6 units

Use (SHIFT) with any of these keys to TRANSPOSE DOWN.
Use 0 key to shift REAL-TIME TRANSPOSE Sequences ahead.
Use LEFT-ARROW to shift back.

FUNCTION KEYS IN PLAY

F1	EXITS to MENU 1
F3	ALIGNS playback of Sequences
F5	Cancels all Sequences & shuts off INTERNAL clock
F7	Cancels REPEATS on all NUMBERED Sequences (1-9).
(SHIFT)F1	Resets REAL-TIME PITCH transpose
(SHIFT)F3	Resets REAL-TIME VELOCITY transpose
(SHIFT)F5	Resets REAL-TIME DURATION transpose

FUNCTION KEYS IN REAL-TIME RECORD AND OVERDUB

F1	Stop RECORDING & EXITS to MENU 1
F3	ALIGNS end of sequence
F5	ERASES current recorded sequence, CANCELS all Sequences played, & turns off internal clock
F7	Starts RECORD with silence Shuts off RECORD & starts PLAYBACK

FUNCTION KEYS IN STEP-TIME RECORDING

F1	QUITS PLAY mode - 2nd time EXITS to MENU 1
F3	Specifies new TIME separation for next note
F5	INSERTS a REST
F7	PLAYS Sequence back

FORMAT FOR EDIT COMMANDS

LIST, QLIST, HCOPY, PLAY, DELETE & TRANSPOSE all use same format.

L2	Single event
D4-10	Range of events
P3-	Specified start to end
T	No range = whole sequence
LM2	Specify events on one MIDI channel
EXCEPT	D (no range) is not a valid format for DELETE
EXCEPT	TM1 If a Sequence contains events on several MIDI channels, you can't transpose only 1 channel

NAME = NBASS	Give Sequence an 8 character NAME.
REPEAT = R8	Set number of repeats.
SWITCH = S1-2	Switch all events to another MIDI channel.
MOVE = M3-12	Range must be specified. Program will prompt
COPY = C1-19	INSERT AFTER: Respond with event number.
INSERT = I	Insert at beginning of Sequence.
I12	(specify event # to insert after).
EXTEND = E	Add events to end of Sequence.
EXIT = X	Press 2X if in LIST mode. Press 1X if in EDIT MENU PAGE.

SEQUENCE START EVENTS - Any Sequence Key under TYP.
Pitch transpose under NOTE.
Velocity transpose under VEL.
Number of Repeats under DUR.
WAIT = W After Repeat value under DUR

FILE FORMATS

This section is intended for the use of experienced programmers who wish to write programs that use or create data files in the form used by the Keyboard Controlled Sequencer. PLEASE DO NOT CALL DR. T'S FOR CLARIFICATION OR PROGRAMMING HINTS.

Dr. T's Music Software will consider for publication any such programs developed by users. We are not, however, willing to reveal source code listings. Note that all two-byte numbers are stored in the standard 6502 format, (low-byte, high byte).

The Sequencer uses two different types of files, single sequence files and files containing all sequences in memory. The data for each sequence is stored internally as a series of six byte events. The format for each event is as follows:
Byte 1 and 2 are always the number of time-steps since last event. For standard MIDI events, the next three bytes are the bytes actually sent out over MIDI when the event occurs. If the event is a note-on event, the last byte is the duration of the note in time-steps. For DE events, the third byte is 0, and other bytes are irrelevant. For single byte events (*events), the third byte is 64 and the fourth byte is the byte to be sent over MIDI.

For sequence start events, the third byte is the relative sequence number (1 for sequence 1 ... 9 for sequence 9, 10 for sequence A ... 35 for sequence Z). The fourth and fifth bytes are the pitch and velocity transposes increased by 64. The last byte is the number of repeats, if a WAIT was not specified, and 100 + the number of repeats, if a WAIT was specified.

A single sequence is stored in a file whose first two bytes contain the length of the sequence in bytes. The remainder of the file contains the sequence data itself.

Sequence data is stored in memory as a string of 3550 consecutive sequence events (totaling 21300 bytes). Starting locations described below refer to the sequence event numbers, thinking of the first event as 1 ... up to 3550. The data for files containing all sequences is stored in the following format:

The number 420, followed by the following data for each sequence in order (1-9, A-Z):

The starting sequence event of each sequence (low-high).

The ending sequence event of each sequence (low-high). If the starting sequence event for a sequence is zero and the ending event is not zero, the sequence key is used for an alternate key assignment. The first byte of the location used for the ending sequence event contains the number of the sequence used in the alternate key assignment.

The number of times the sequence is to repeat if started from the computer keyboard.

The remaining fields are used only for alternate key assignments.

The pitch transpose of each key assignment + 64. The velocity transpose of each key assignment + 64.

The duration transpose of each key assignment + 128.

The starting event within the sequence of the key assignment (low-high). (0 means start at beginning.)

The ending event within the sequence of the key assignment (low-high). (0 means end at the end of a sequence.)

The sequence data starts at byte 423 of the file. The data for each defined sequence are stored, in the same format as that used in single sequence files. The sequence data are followed by the number 280, and the 35 sequence names.

APPLICATION NOTES

Since new equipment continues to be released at an increasing rate, it is not possible to make a complete listing of products that will work with the KEYBOARD CONTROLLED SEQUENCER. Many instruments share design features, so the following information may be useful even if you do not own the instruments discussed.

Instruments are listed in alphabetical order of manufacturers.

CASIO CZ-101

The CASIO CZ-101 is a programmable eight voice polyphonic digital instrument. It can hold 32 programs (16 of these are presets and may not be changed) or 48 programs if you buy the optional RAM cartridge. Dr. T's SOFTWARE also has available a PATCH PROGRAMMER.

The CASIO CZ-101 is very useful with the KEYBOARD CONTROLLED SEQUENCER because it can also function as four mono synths. It may be programmed to work on any four adjacent MIDI channels, with each channel playing a different sound. One drawback is that there is only one output jack for the four different sounds. You will have to change DCA envelope levels to balance the relative volumes.

There is no MIDI thru, so you'll need a MIDI junction box or else patch the CZ at the end of the MIDI chain. The CASIO is not sensitive to velocity but responds well to DURATION because of its three 8 stage envelope generators.

You can put the CZ-101 in mono mode by pressing the SOLO button. You can then use the MIDI, cursor right, and up-arrow buttons to select programs, or you can select programs from the Sequencer. Each program can be specified with either of 2 numbers.

FROM SEQUENCER SPECIFY	CASIO RESPONDS
PG 0 - 15	Presets 1 - 16
PG 16 - 31	Presets 1 - 16
PG 32 - 47	Internal 1 - 16
PG 48 - 63	Internal 1 - 16
PG 64 - 79	Cartridge 1 - 16
PG 80 - 95	Cartridge 1 - 16

KORG EX-800 and POLY 800

These two synths are similar with the newer EX-800 being a keyboardless version of the Poly-800 with a few more features. Both machines send on channel 1 and may be set to receive on any channel and both may select an external MIDI clock to drive their own sequencer along with Dr. T. The Poly 800 sends its sequence

data on channel 2. These instruments both select programs using 'banks'.

DR. T program #	KORG #:
0 - 7	11 - 18
8 - 15	21 - 28
16 - 23	31 - 38
24 - 31	41 - 48
32 - 49	51 - 58
40 - 47	61 - 68
48 - 55	71 - 78
56 - 63	81 - 88

The EX-800 can also set the depth of pitchbend (responding to 5 of the most significant bits).

KORG DW-6000

The DW-6000 is a 6 voice synth with 64 programmable memories. It features a digital waveform generator system. The DW-6000 will send and receive note data, program change, pitchbend, OSC mod, VCF mod, damper pedal, portamento switch and system exclusive messages.

These Korg instruments neither send or receive velocity, but they do respond to 'volume' information. When sending CC events to a Korg instrument, use the following CC parameters and values.

Function	CC#	Value
OSC modulation	01	0 - 127
VCF modulation	02	0 - 127
Volume	7	0 - 127
Damper Pedal (DW-6000)	32	0 or 127
Porto switch (DW-6000)	33	0 or 127

KORG KMS-30 synchronizer

The KORG KMS-30 is a useful device which can perform three separate functions. It will synchronize the KEYBOARD CONTROLLED SEQUENCER and drum-boxes to tape via MIDI clock or sync tone. It can also function as a MIDI split box. There are actually a few ways to patch the KMS-30.

```
     TAPE  IN: Allows Korg & any other instruments patched to it's
               MIDI outs to be driven from a recorded sync track.
          OUT: Will lay a sync track to tape for future syncing.
       SWITCH: Turns sync mode on or off.
     SYNC  IN: will accept a drum clock.
          OUT: Independently selectable 24/48 clock.
          OUT: Independently selectable 24/48 clock.
     MIDI  IN: Patch from SEQ MIDI box out.
          OUT: Patch to synths or MIDI drum-box.
          OUT: Patch to synths or MIDI drum-box.
CLOCK SELECT: Tape, Sync or MIDI.
```

KORG KMS-60

The KORG KMS-60 is a MIDI JUNCTION box. It consists of 1 MIDI INPUT and six MIDI OUTPUTS. Useful if you have several synths daisy-chained together (will eliminate delay times) or instruments with no MIDI THRU's.

VOYETRA 8

The Voyetra 8 (made by Octave Plateau Electronics) is a polyphonic 8 voice machine which may be programed to respond as two independent 4 voice machines. Each of these 4 voice instruments can be assigned to any MIDI channel. Enter the MIDI page on the Voyetra by pressing A440 & ARP DOWN, and select the MULTI-TRACK SEQUENCER preset button (ARP RANDOM). Make sure the patches you are using are programmed to respond to velocity, pressure, mod-wheels. etc.

Only REV4 Voyetras can receive all MIDI parameters. Refer to the Owner's Manual for proper MIDI codes. REV3s will respond to NOTE and velocity information only, and both versions can only send NOTE and velocity information. When configuring the V8 for MULTI-TRACK SEQUENCER, the joystick operates differently. Now joystick left will modulate the left program and joystick right will modulate the right program. Each side will respond to what ever MIDI modulation information is sent on it's respective channel, however. This allows you to still 'play' the joystick along with what ever MIDI control data is being sent.

YAMAHA DX7

The DX7 makes an excellent recording KBD for the KEYBOARD CONTROLLED SEQUENCER because it has good dynamics and sends and receives all MIDI control parameters. Since it has 16 voices, the SEQUENCER can be echoing back to the DX7, without much risk of 'running out' of voices.

A few subtle changes have been made to the DX7's ROMS since their initial release. DX7's can only send on MIDI channel 1, but may receive on any channel. Early DX7's use control parameter 3 for AFTER-TOUCH, and will not respond to AT type events. You may find you want to leave AFT off because it uses up memory very fast.

To specify a PROGRAM CHANGE for the DX7, have the SEQUENCER specify 1 value less than you want on the DX7. The DX7 starts counting at 1 while other instruments start counting at 0. The statement PG 22 from the SEQUENCER would call up program 23 on the DX7.

YAMAHA RX11 & 15 DRUM MACHINES

The RX11 features several variations of the most essential drums. There are 8 snares, 3 kicks, 3 closed hats, 2 open hats, 2 cowbells, 2 claps, and 2 rimshots. Concerning MIDI compatibility, the RX11 has a lot of good features. It's drawbacks are: no MIDI THRU and it may only run on it's internal clock when you are creating a pattern on it.

CLOCK:	
SEND	24 pulse or MIDI clock during play only
RECEIVE	24, 48, 96 pulse or MIDI clock during play only
NOTES:	
NOTES	may be sent & received by SEQUENCER.
PATTERNS	may be sent & received by SEQUENCER.
ASSIGN	each drum may be specified to any note
CHANNEL:	
	whole kit may send or receive on any 1 channel.
	each drum may be assigned to any MIDI channel.

There are several options available with the RX11. You may compose patterns on the drum machine and use the SEQUENCER's MIDI clock to drive the RX11 or have the RX11's pulse or MIDI drive the SEQUENCER. You can create patterns on the SEQUENCER to play the drum machine using either the drum clock or the SEQUENCER's internal clock. This method lets you keep the complete score (music & drum parts) for a song on disk. The SEQUENCER's MIDI clock will START the RX 11, so you should set the drum machine to an 'empty' pattern before playing.

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ADDITIONAL TROUBLE SHOOTING NOTES (COMMODORE VERSION)

On DX and TX synthesizers, notes may occasionally hang up and you may get a MIDI DATA ERROR on the read-out panel. This has to do with a problem that occurs in SOME DX and TX synthesizers. We are not 100% sure of the cause of the problem; however, we have isolated it enough to feel that the problem is in the chips WITHIN the Yamaha instrument that control the baud rate of the reception and transmission of the MIDI data stream. In any event the fix that we have adopted seems to cure the problem. DO NOT use any of these fixes unless you are sure that you have this problem. The solution involves a very slight slowing down of the transmission rate and could minutely affect performance. Load one of the following programs, depending on which interface you are using:

FT if you have SEQ 242 or model T interface.
FP if you have the PASSPORT interface.
FM if you have the MOOG interface.

If you are using an OLD COMMODORE 64, the program may hang up. If so load the program:

OT if you have SEQ 242 or model T interface.
OP if you have the PASSPORT interface.
OM if you have the MOOG interface.

IF THIS DOES NOT CURE THE PROBLEM, CALL US.

ADDITIONAL TROUBLE SHOOTING NOTES (APPLE VERSION)

The Keyboard Controlled Sequencer will not work if a Mountain Hardware Card is installed; it must be removed while you are using the sequencer program.

If you are using an Apple II+, the Keyboard Controlled Sequencer will not work with an early version of an ANDROMEDA memory card.

PREFACE

Thank you for purchasing the Apple version of the Keyboard Controlled Sequencer.

DIFFERENCES BETWEEN THE APPLE AND COMMODORE VERSIONS

The enclosed User's Manual is the manual for the Commodore version of the program. Differences between the Apple and the Commodore version are relatively minor.

The Apple program is bootable. You do not need to specify and interface, as only the Passport and the identical Syntech are supported. The program will ask if you wish to use the initialization section, described below under INITIALIZATION FUNCTIONS, to make any changes. If you do not choose to make any changes, it will go directly to the main menu.

The program assumes that your MIDI interface card is in slot 2, and that your printer, if any, is in slot 1. It does not support an 80 column card.

Applesoft Basic displays a cursor whenever input of any length is requested. In most situations where only a single character is required, you do not need to follow your entry by pressing the (RETURN) key.

The program supports the sync-to-tape feature provided on some Passport or Syntech interfaces. This feature is described in a separate section below.

DIFFERENCES BETWEEN THE COMMODORE AND APPLE KEYBOARDS

Many of the differences between the Apple and Commodore versions of the program are caused by differences in the keyboards of the two computers. The Commodore Keyboard is more complete than the Apple IIe's and the Apple IIe's is more complete than the II+'s. We have attempted to strike a balance between using the IIe's keyboard to full advantage, and giving II+ users access to all functions of the program.

The Commodore keyboard has four function keys, labeled F1, F3, F5 and F7. These keys are used extensively in the record, play and step-time record sections of the program. On the Apple IIe you can use the cursor left, cursor right, cursor down and cursor up keys respectively as substitutes for these function keys in any situation. On the Apple II+, you can use CTRL-J and CTRL-K as substitutes for the cursor down and cursor up keys. You can also use !, ', #, and $ instead. You may find this more convenient because these characters are, on the II+ , the shifted numerals 1 through 4. Note that the cursor left key will also stop the edit list function and put you directly into edit. This

key will also work if you had previously pressed another key to temporarily stop the list.

The Commodore program uses shifted keys in sequence play mode to mute a currently playing sequence. It also uses shifted real-time transpose keys to execute downward transposes. In order to maintain compatibility between the IIe and II+ version of the program, we have used the ESC key as a substitute for the shift key in play mode. To achieve any effect created by a shifted key in the Commodore program, press the ESC key FOLLOWED by the key that you want shifted. The Commodore program uses a left arrow key to move the REAL-TIME SEQUENCE selection backward through the sequence list. The Apple program uses ESC O instead. The F2, F4, F6 and F8 keys on the Commodore are shifted versions of the F1, F3, F5 and F7 keys, so they can be invoked by pressing ESC followed by the corresponding Apple key. These keys are only used to cancel real-time transposes.

A minor difference between the two programs is the entry of triplets using time value abbreviations in the TYPE FROM COMPUTER KEYBOARD mode (page 44). Instead of using a shifted W, H, Q, E, or S to specify a time of 1/3 of a whole, half, ... enter a Y, I, R, or F.

FULL SCREEN EDIT

Applesoft Basic, as you probably know, does not have a built in full-screen editor. Thus we had to write routines for editing the note list that is displayed by the list and edit option. The cursor keys, and their Apple II+ control equivalents, can be used to move the cursor anywhere on the screen, as in the Commodore program. Several additional cursor control keys have been defined:

DELETE or !	Move cursor to Time field of top event displayed on screen
TAB or CTRL I	Move cursor one editable field to the right. Note that the MSR-ST and EVNT fields are not editable.
BACKSLASH or %	Move cursor one field to the left.
(or @	Move cursor up five lines.
) or $	Move cursor down five lines.

As on the Commodore program, YOU MUST PRESS RETURN while the cursor is on the line that you wish to change. you can enter any edit command by typing it starting at the left edge of any line. Be sure to leave a space between the end of the command and any text remaining on the line.

An additional edit command, Z. Edit NEW SEQUENCE has been provided. To shift from editing one sequence to editing another, type Z followed by the key of the sequence you wish to edit and (RETURN). This command can be entered from either the main edit menu or the edit list screen.

REAL-TIME TRANSPOSES

The display of the functions of the real-time transpose keys, as shown for example on the bottom of the screen picture on page 22, is not provided on the Apple program, as the Apple screen is one line shorter than the Commodore's. The functions of these keys can be edited in the INITIALIZATION section of the program. The Apple IIe real-time transpose keys and their functions are:

-	Transpose pitch 1 half-step.
=	Transpose pitch 2 half-steps.
Delete	Transpose pitch 4 half-steps.
{	Transpose pitch 7 half-steps.
}	Transpose pitch 1 octave.
Backslash	Transpose velocity 6 units.
;	Transpose velocity 12 units.
,	Transpose velocity 24 units.
(RETURN)	Transpose duration 1 clock step.
/	Transpose duration 3 clock steps.

Six of these keys are available on the Apple II+. Some of them are shifted. Do not use the ESC key for these shifts.

Each of these keys will cause an upward transpose if the ESC key was not pressed immediately before the transpose key, and a downward transpose otherwise.

INITIALIZATION FUNCTIONS

When you boot up the program, it will ask the question DO YOU WANT TO CHANGE INITIALIZATION? A yes answer allows you to change the default values given by the program to the keys used in step-time entry and real-time transposes. It also allows you to change some of the clock functions.

The initialization section of the program presents you with the first three options described starting on page 26 of the manual. Selecting option 1, CLOCK FUNCTIONS, will bring up a menu with 6 items on it. The SENDING MIDI CLOCK, NOT TOGGLING START/STOP, and 24 STEPS/METRONOME items are described in the Commodore manual.

Item 4 allows you to decide whether you want to use the Apple's internal metronome while recording. Item 6, which defaults to USING MIDI START/STOP affects the operation of the program when using an external MIDI clock.

Most devices (drum machines and external sequencers) that send MIDI clock send a MIDI START command when they are started and a MIDI STOP command when they are stopped. Many send MIDI clock even when they are not playing music, so using MIDI START/STOP will tell the sequencer not to respond to external MIDI clocks until a MIDI START or CONTINUE command is received, and to stop playing when a MIDI STOP command is received. Turn this feature off if you are syncing to an external device that sends MIDI clocks but not START/STOP.

Item 3 allows you to change the number of internal clocks (in the interface card) required for each sequencer clock. Note that the internal clock in the interface card is used when either INTERNAL CLOCK or TAPE SYNC is selected from the CHANGE CLOCK menu. In one case the clock is driven by the computer's clock, and in the other case by the tape sync tone. The relationship between the internal clock of the interface, the Sequencer's clock, and the pulse clock output can be somewhat confusing. The interface generates only one pulse out for every two internal clocks, allowing it to sync with a pulse drum machine.

The number of internal clocks per software clock can be edited. If you are not using a pulse drum machine, you may want to change the number of internal clocks per sequencer clock to 1, as this will give you more resolution in setting the internal clock.

The beats/minute display will reflect the current value of INTERNAL CLOCKS PER STEP. The program will send one MIDI clock for every sequencer clock unless you turn the MIDI clock off.

Note that the clock speed change from a sequence, described on page 62, changes the time between internal clocks. You must take the number of internal clocks per step into consideration when using this feature.

DISK FUNCTIONS

Selecting option 7 on the main menu brings up a separate menu of DISK FUNCTIONS. Items 1 and 2 are similar to items 6 and 7 on the Commodore program's secondary menu (pages 62-64). If a file has been previously loaded or saved, the program will ask if you want to use that file. If you do not want to use it, or if there is no previous file, the program will ask you to enter the desired file name.

Item 3 on the DISK FUNCTIONS menu will display on the screen the catalog of the disk in the current slot and drive. Note that single sequence file names have the prefix SQ., and all sequence file names have the prefix SQALL.

Item 4 allows you to change the drive within the current disk I/O slot. Selecting item 4 will cause the drive number to change and the catalog of the disk in the new drive to be displayed.

Item 5 allows you to specify a slot and volume number. It is mainly intended for users of hard disks. We do not guarantee that the proprietary DOS supplied with the program will work on any particular hard disk.

CAUTIONS!!!

UNLIKE THE COMMODORE PROGRAM, the program will NOT warn you if you are about to save over an existing file, so BE CAREFUL!. The Apple program will also NOT CHECK FOR SUFFICIENT SPACE before attempting to load a SINGLE sequence. Loading a sequence that is longer than the space remaining will overwrite the DOS pointers and crash the program. If in doubt, SAVE FIRST!

CLOCK OPTIONS

Selecting the CHANGE CLOCK option on the second menu will bring up a short menu allowing you to choose a clock source from INTERNAL CLOCK, MIDI CLOCK, and TAPE SYNC. MIDI CLOCK must be supplied through the MIDI IN port of the interface. If INTERNAL CLOCK is selected, the program will ask you to enter a value for beats/minute, and compute a clock rate on the assumption that one measure is equal to four beats.

USING THE SYNC-TO-TAPE FUNCTION

Some Passport and Syntech interfaces are equipped with sync to tape. Such interfaces allow you to sync the software to tape without using a drum machine. Connect the tape out jack of the interface to a line in on your deck, and the tape in jack to the corresponding line out.

A. Recording the Sync-tone.

The interface will put out a sync tone whenever the sequencer's INTERNAL CLOCK is running. The internal clock does not start immediately upon entering play mode. It will start once you press a sequence key. Note that NO SYNC TONE will be put out if you are using MIDI CLOCK as your clock source.

You should experiment with different recording levels. A sync tone should generally be recorded at the lowest level at which it can be reliably read. A high level sync tone may cause crosstalk or erasure problems. Averaging meters will show a higher level as the clock rate increases. Note that the sync-to-tape feature IS compatible with DBX, at least on a TASCAM 234 deck.

It is considered good practice to record the sync tone BEFORE recording any music.

B. Syncing to a Recorded Sync Tone.

Make sure that the output of the sync track on the tape is connected to the tape in of the interface, and that you have selected the TAPE SYNC option from the clock menu. Cue up the recording deck slightly BEFORE the start of the sync track. Put the sequencer in play mode and start the desired sequence(s). No music will play until the tape deck is started. Once the deck is started, the sequences will play in synchronization with the recorded sync tone.

Note that if you have both tape in and out connected,and are monitoring source instead of output from the deck, the sequence WILL start playing as soon as you press the key. Change the monitor switch and start again.

If you use the cursor down or # keys to cancel play while using sync to tape, you will have to press the space bar to get the software to accept the sync signals again.

C. Fine Points of Synchronization

The software recognizes time data to an accuracy of one time step, initially about 20 milliseconds. Some users have found that the 'feel' of a drum part changes depending on whether the drum machine is the master or the slave. This is because of subtle differences in the order in which things are done by the various devices. There are accessories on the market that will delay a clock slightly between devices, giving more control over 'feel'. Another way to get more control is use a faster clock rate and adjust your sequences and drum programs accordingly. Obviously, 10 ms. accuracy gives more control than 20 ms.

If you want to 'punch in' a sequence part in the middle of a previously recorded track, you can do so provided that your deck allows you to turn track record on and off 'on the fly'. Simply write a rest of the appropriate length at the beginning of the desired part, start the recorder from the beginning, and turn on track record just before you reach the new part.

You can also start the desired sequence while the deck is running. Once started, it will stay in sync, but the starting time is 'up to you'. A third possibility is to start the tape from the beginning and use the ALIGN feature of the program to be sure that the manually started sequence starts a whole number of measures from the beginning of the piece. This saves the trouble of calculating the desired rest.

It MAY be possible to sync other external devices to the software using the tape sync in. We give no guarantees, and one technician expressed concern that a five volt signal might be too hot for the input and damage the interface. This seems unlikely, but proceed at your own risk.

It takes FOUR ticks of the sync track to produce one tick of the interface's internal clock.

ERROR TRAPPING

If a BASIC or DOS error occurs, the program will issue an error message. The most likely DOS errors, (I/O error, disk full, file not found), are explicitly printed out. Other errors will give the message ERROR NUMBER nn IN LINE nn. If a BASIC error occurs, please notify Dr. T SOFTWARE.

In any case, the program will go back to the main menu, as soon as you press a key.

OTHER DIFFERENCES

The Apple program compresses the sequence data every time it reaches the main menu. Consequently, there is always a single free space chain, and the * feature described on page 37 is not needed.

The Apple program will print a hard copy of the sequence map. It also allows a screen display of the catalog.